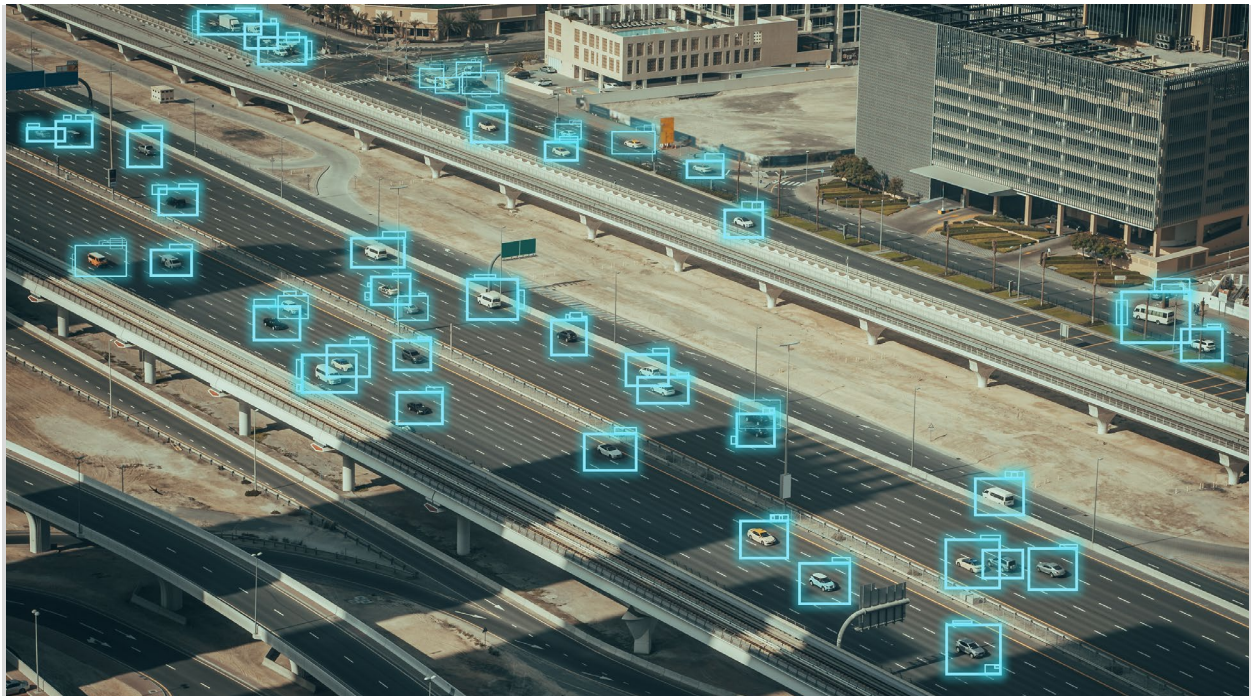


Strengthening Data Science Skills at Turner-Fairbank



Summary Report — June 2025

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Contents

Executive Summary	1
1. Introduction	2
2. Background	3
2.1 Users of the Upskilling Program.....	3
2.2 Topics for Upskilling	4
3. Methods.....	7
3.1 Phase I: Exploring Turner-Fairbank Needs and Capacity	7
3.2 Phase II: Developing a Model for Meeting Turner-Fairbank Needs and Building Capacity.....	12
3.3 Phase III: Piloting an Approach to Meeting Turner-Fairbank Needs	17
3.4 Developing Approaches to Encourage DS Use.....	22
4. Conclusions	25
5. References	27
Appendix A. Turner-Fairbank Staff Interview Questions	28
Appendix B. Highlights from Initial Turner-Fairbank Interviews.....	29
Appendix C. Baseline Survey.....	33
Appendix D. Course Catalog.....	34
Foundational Courses	35
Supplementary Courses.....	39
Appendix E. Course Assessment Tool.....	46

List of Figures

Figure 1. Relationships among DS, ML, and AI	4
Figure 2. Process of DSP Development.....	13
Figure 3. AI and DS Course Topics Linked to Interviewees' Desired Capabilities	14
Figure 4. Course Vetting Process	18

List of Tables

Table 1 Factors to Consider Before Using ML Rather than Traditional Statistical Methods	6
Table 2. Key Findings from Turner-Fairbank Meetings and Interviews	8
Table 3. DS Knowledge Needs-Based Personas at Turner-Fairbank.....	11
Table 4. Highlights from SME Discussions to Shape DSP Prototype and Pilot Testing	15
Table 5. Constraints on Selections for Course Catalog	15
Table 6. Pilot Testers' Team/Office.....	17
Table 7. Pilot Testers' Training Goals.....	19
Table 8. Foundational Courses: General Assessment.....	19
Table 9. Supplementary Courses: General Assessment.....	20
Table 10. Pilot Testers' Vision for Using Expert Advising Service	21
Table 11. Challenges and Opportunities Related to Encourage DS Use at Turner-Fairbank.....	23

List of Abbreviations

Abbreviation	Term
AI	Artificial intelligence
ART	Advanced Research & Testing
DS	Data science
DSP	Data science upskilling program
FAA	Federal Aviation Administration
FHWA	Federal Highway Administration
GDPR	General Data Protection Regulation
GPU	Graphics Processing Unit
GSA	General Services Administration
HRDI	Office of Infrastructure Research and Development
HRRS	Office of Research Services
HRSO	Office of Safety and Operations Research and Development
LLM	Large language model
ML	Machine learning
MOOC	Massive open online course
NAS	National Airspace
PANDA	Path to Advancing Novel Data Analytics
R&D	Research and development
RD&T	Research, development, and technology
SME	Subject Matter Expert
STEM	Science, technology, engineering, and mathematics
USDOT	United States Department of Transportation
VIA	Volpe Innovation Accelerator

Executive Summary

Artificial intelligence (AI) and machine learning (ML) are increasingly shaping innovation opportunities across sectors of society, including transportation. Therefore, to help create the future of transportation effectively, researchers must have some expertise in AI, ML, and the data science (DS) that underlies them both. Because Turner-Fairbank is home to FHWA's Office of Research, Development, and Technology, Turner-Fairbank leaders and staff have a special responsibility to be knowledgeable in DS, ML, and AI.

This report represents a major step to meet that responsibility: it describes an 18-month effort to define an upskilling program for Turner-Fairbank staff. The report is written to enable Turner-Fairbank leadership to begin piloting a program for upskilling in DS, ML, and AI. In this sense, it is a blueprint for an upskilling program that can be effective now. It is also intended to guide future teams at Turner-Fairbank seeking to update the program. It is intended to convey principles and practices that should survive the ongoing evolution of AI, ML, and DS tools and methods.

In the development of the DS upskilling program, the team uncovered some core lessons:

- There is strong interest in AI training, and especially in training that includes hands-on experience.
- Plan on having a foundational level: Everyone needs to know the basics.
- Consider AI coaches—personal guides.
- Consider self-service short-form videos. YouTube is a great resource.
- Find and use reliable providers. The AI training landscape is massive and diverse, so outsourcing course selection & quality assurance to some extent will be critical.
- Focus on serving R&D project managers that may need to conduct R&D.
- Provide support and ensure access to computing resources so students can use new skills.

To use this report, Turner-Fairbank leaders should leverage existing cross-Center forums to build awareness and encourage engagement with the upskilling program. These forums include quarterly meetings, weekly emails, and the recently dormant Data Science Task Force. It will be critical throughout the awareness and engagement campaign to emphasize the dynamic, ever-evolving nature of the upskilling program. This dynamism is in part because of the rapid evolution of DS, ML, and AI, and partly in response to emerging and shifting user needs. For the data science upskilling program to be effective, it must adapt to staff needs.

If some version of the prototype data science upskilling program described here is implemented, it will help keep Turner-Fairbank at the forefront of highway research, where it belongs.

I. Introduction

This report describes the results of work to develop a program for upskilling Turner-Fairbank Highway Research Center (Turner-Fairbank) staff in the fields of data science (DS), machine learning (ML), and artificial intelligence (AI). It is intended for use by leaders at Turner-Fairbank so that they can begin to implement a data science upskilling program (DSP) to ensure that Turner-Fairbank staff have the knowledge they need about DS, ML, and AI so that they can do their work most effectively.

The rest of this document is organized as follows:

- Section 2, Background, describes the Turner-Fairbank community whose knowledge needs will be met by the DSP and the topics that the DSP addresses.
- Section 3, Methods, describes the three high-level steps that the Project Team took in developing the prototype DSP: exploring Turner-Fairbank needs, developing a prototype program to meet those needs, and testing the prototype. It also describes the kindred task of identifying approaches to encourage the use of DS at Turner-Fairbank.
- Section 4, Conclusions, summarizes the core results from the work.

2. Background

To set the context for the development of the DSP, it is important to describe the user community that the DSP will serve and the topics in which the DSP will deliver skills.

2.1 Users of the Upskilling Program

Turner-Fairbank is a federally owned and operated research facility whose core activity is managing and performing research and development (R&D), and all activities at the center support this core activity. Located in McLean, VA, it houses FHWA's Office of Research, Development, and Technology (RD&T). Turner-Fairbank reviews, tests, studies, develops, and finds solutions to complex technical problems through the development of more economical designs; more efficient, quality-controlled construction, operational, and safety practices; and more durable materials.

The skills and expertise at Turner-Fairbank encompass numerous transportation-related disciplines including civil, structural, and pavement engineering; chemistry; safety; mathematics; computational development; modeling and simulation; information technology; hydraulics; aerodynamics; imaging; geometric design; photometry; visibility; human factors, and many more. In addition to skills and backgrounds, there are also varying degrees of tenure across the different teams and offices.

The Office of RD&T encompasses the Office of Infrastructure Research and Development (HRDI); the Office of Safety and Operations Research and Development (HRSO); and the Office of Research Services (HRRS). Staffing across the three offices comprises three major categories: permanent Federal personnel, contractors, and temporary Federal personnel such as fellows and interns. Given the transient or limited relationships between contractors and temporary personnel with Turner-Fairbank, while a DS knowledge program may benefit them, these two groups are not the core audience of the capacity building program described here.

In addition to wide-ranging disciplinary areas among Federal personnel, there are also varying degrees of engagement with projects themselves. There are four major types of work at Turner-Fairbank and some roles tend to concentrate on one type of work over others: managing research projects throughout their lifecycle; conducting intramural research; leading and managing internal processes; and operating internal processes that keep Turner-Fairbank running. These four categories informed the four personas that structured the approach and framing for the DSP. (See Table 3.)

Staff's backgrounds and experiences are factors in their reception to new technology and how they can engage with it. As such, any approach to developing a DS upskilling program should consider all these elements that make up the user base at Turner-Fairbank. The rapidly evolving nature of AI necessitates a DSP approach that is both adaptable and generalizable so that users can have a strong enough foundation to be able to articulate their questions about AI and leverage existing resources to answer those questions.

Aside from research engineers, research project managers work most closely with data and AI through their project oversight and management of research teams that generate data and develop data-driven innovations. For that oversight to be effective, research project managers need some understanding of the methods the research engineers use, including AI, DS, and ML. Upskilling current and future staff members at Turner-Fairbank support not only their daily activities, but also their ability to explore additional opportunities for managing and conducting research.

2.2 Topics for Upskilling

AI, DS, and ML are closely interrelated, and they are all in scope for the upskilling program described in this document. Figure 1 illustrates the relationship among these three concepts. The concepts have been defined differently by different sources, and this is especially true for AI. The definitions used in this project are below.

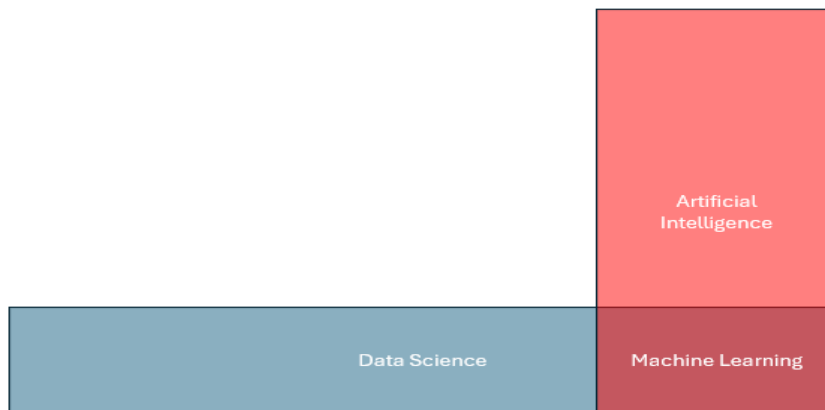


Figure 1. Relationships among DS, ML, and AI

- AI “is technology that enables computers and machines to simulate human learning, comprehension, problem solving, decision making, creativity and autonomy.” (IBM, 2025)
- DS “is a field of study that uses scientific methods, processes, and systems to extract knowledge and insights from data.” (U.S. Census Bureau, 2025)
- ML “is a subfield of artificial intelligence that gives computers the ability to learn without explicitly being programmed.” (Brown, 2021)

Thus, ML is a part of AI, according to their definitions. As a method for extracting knowledge from data, ML is also a part of DS. Beyond these definitional points, one further note on the relationship between AI and ML is critical: Essentially all modern AI is built on ML. That is, the modern computer systems that act in ways that “simulate human... comprehension, problem solving, decision making, creativity and autonomy” are capable of those actions by virtue of trained ML algorithms.

Because ML underpins modern AI, understanding the limits of modern AI requires understanding, to some degree, the ML that makes it possible. Now, ML is built on data, such that high-quality ML algorithms are only possible with properly gathered, managed, and cleaned data. Combine that observation with the fact that DS as a discipline includes the pre-analysis work with data that enables knowledge to be extracted from it, and we conclude that being able to discern high- from low-quality ML requires some knowledge of DS.

As noted above, ML is a part of DS. Importantly, it is **not** the only or consistently the best way to analyze data—the final step in the gather-clean-manage-analyze data pipeline. It remains true that non-ML statistical methods are better suited to many kinds of problems. The rationale for choosing ML versus non-ML analytical methods is presented in Table 1 below.

Table 1 Factors to Consider Before Using ML Rather than Traditional Statistical Methods

Factor	Considerations
Volume versus Complexity	While traditional methods will typically process data more quickly than machine learning methods (i.e., they handle high-volume data well), they are not as efficient with complex tasks or data. Complexity roughly refers to the number of important features in the data set.
Accuracy	Because ML models generate results based on patterns from training data rather than fixed rules, for certain types of scenarios including those where inviolable laws apply, such models have worse accuracy compared to a traditional rule-based approach. For example, typical large language models (LLMs) do not reliably solve math problems. For the same reason, LLMs are prone to “hallucinate,” generating outputs that appear authoritative but are in fact invented.
Explainability	ML models, particularly advanced deep-learning neural network systems, are often far too complex for humans to be able to understand or explain with granularity. This can make more complex machine learning programs a “black box,” where even the creator of the model may have difficulty explaining exactly how the model goes from inputs to outputs.
Computing Resources	Although traditional machine learning approaches can run on a typical personal computer with a CPU, deep learning approaches (including LLMs) are computationally intensive, requiring a graphics processing unit (GPU) or other special hardware. Large LLMs, typically over 8GB, require a cluster of powerful GPUs with a high amount of on-board memory (known as VRAM). This can be prohibitively expensive, so they are usually provisioned as a FedRAMP approved cloud platform.
Human Resources	ML systems are complex and rapidly developing, and the skills needed to implement them properly can take a long time to develop. A team that can design, develop, and deploy an ML-based AI solution from scratch can be difficult to assemble, especially in the public sector.
Data privacy	Many publicly available GenAI models that are large and complex enough to be used in real-world applications are owned and operated by large companies that use user data to improve their models. One should always keep in mind terms of service and data privacy when interacting with these systems. Defer to agency rules and guidelines when using these systems.

3. Methods

From Fall 2023 through Winter 2025, the Project Team developed and tested the prototype DSP

3.1 Phase I: Exploring Turner-Fairbank Needs and Capacity

Understanding how different offices within Turner-Fairbank are using DS and AI tools in their work is key to understanding each group's training needs. Teams with little to no research using DS may have different training needs than an office that is already fully utilizing DS tools and is keeping up to date with cutting edge developments in the field. Phase I covered the approach that the Project Team took to understand the range of DS-related activities and information needs at Turner-Fairbank. Key findings from Phase I directly informed the approach and rationale for Phase II.

The primary questions that the team explored are:

1. **Who is in the group of users?** Answers to this question can include user backgrounds, their way of working, the size of the user group, skill sets, hiring practices and procedures, and anything else that can affect how the user would engage with the program. Phase I assumed that the group of users includes all Turner-Fairbank staff and contractors¹.
2. **What are the current DS-related practices and needs of these users?** This may involve instances where users are currently interacting with DS-based tools and services, as well as instances where they are not using DS-based tools but should be.
3. **How, when, and why will users engage with the DSP?** This question examines the types of problems that users are trying to solve and what benefits they are seeking from the DSP. This also involves understanding where in their existing work processes users might access the program and integrate or apply its products and services.

3.1.1 Methods

To design a knowledge program that meets the needs of its users, the Project Team first consulted with the Chief Scientist to better understand the major types of research at Turner-Fairbank and the different roles that make up the various research offices. At the same time, the Project Team gathered preliminary information through the annual Turner-Fairbank Group Meetings, where each office met with the Chief Scientist and his Pathways Intern. During these conversations, where applicable, the Pathways Intern asked staff about how they envision using AI in their work and their perceived barriers to fully incorporating AI tools. Staff also used the meetings to provide recommendations for other teams and offices that Volpe should follow up with to have a deeper discussion about DS needs and how those might be met through a DS program.

Following the Turner-Fairbank Group Meetings and using the contacts that staff recommended, the

¹ The decision not to include contractors in the target audience—specified to enable user-focused design of the DSP—came later.

Volpe Center conducted interviews with 10 Turner-Fairbank offices between December 2023 and January 2024. Nineteen staff members participated in total, and all were either program managers, Team Leads, or research project managers. Four core topics framed the interview questions:

1. What each office or research is working on with AI and DS
2. What AI or DS skills they are using in their work
3. How or where they are getting their information about AI or DS, and
4. What Turner-Fairbank could do to better support AI or DS use in research.

A full list of questions can be found in Appendix A.

3.1.2 Findings

Table 2 summarizes inputs received at the Turner-Fairbank Group Meetings and subsequent interviews.

Table 2. Key Findings from Turner-Fairbank Meetings and Interviews

Interactions with DS-based tools
<ul style="list-style-type: none"> • Limited awareness around which AI algorithms and applications projects are using • Limited familiarity with how AI algorithms and applications work • Limited confidence in output quality • Limited understanding of AI and DS to validate contractors' deliverables
DS needs
<ul style="list-style-type: none"> • Understanding the limitations of current AI and DS tools • Understanding how other researchers and transportation professionals are using AI and DS tools • Increasing awareness of currently available AI and DS tools in the transportation sector • Increasing support from leadership to incorporate AI and DS training into managerial responsibilities • Opportunities for hands-on training and workshops

On **interactions with DS-based tools**, across the offices that the Project Team interviewed, responses indicated there was **little to no direct engagement with AI or DS tools**. Where there was some engagement, those who interacted with the tools were mostly either contractors or temporary Federal employees, such as fellows and post-doctorates. Managers shared that while they may oversee projects that use AI algorithms and applications at some point, they were generally not sure what tools contractors and temporary employees used.

Those who were able to identify specific applications or platforms that are popular in their field, such as PANDA² or ChatGPT,³ were **not confident about how those applications work or their output quality**.

² PANDA refers to "Path to Advancing Novel Data Analytics," a simulation platform that Turner-Fairbank developed and operates. [Path to Novel Data Analytics \(PANDA\) Minimum Viable Product | FHWA](#)

³ ChatGPT is an application hosted on the Internet that accepts natural language prompts/requests and draws on its extensive training data mostly drawn from the public Internet to produce natural language responses that are usually reasonable and useful. It is one of many commercially available "chatbots" that rely on LLM technology.

Research project managers who oversee projects that may involve AI applications said that they only interact with products and data on either side of the process: collecting and generating data for an AI algorithm that contractors manage or interacting with the output after a contractor has used AI or DS to generate the product.

However, **some research project managers expressed some confidence** in the quality of the data and output which contractors generate by assuming that the algorithms perform exactly as the contractors had described. Others have said they do not encounter any challenges in supervising the project because they understand the discipline enough to know the limits and boundaries. If a project falls within those limits and boundaries, they can recognize that the contractor is on the right path. Others have a more hands-on approach; they require a contractor to explain succinctly, but specifically, the problem that they are trying to solve and how they intend to solve it. Those who are unable to answer are disqualified.

On **DS needs**, the interviews highlighted various gaps in AI knowledge and confidence that prevent research teams from fully utilizing AI and DS tools that can enhance their work. One of the biggest concerns that managers have is that there is a **limited understanding of what AI can and cannot do, as well as how they can apply advanced data analytics to their work**. In one instance, a manager attempted to improve their workflow around data but experienced a setback because they did not realize the work required to make the data usable in an AI application was beyond their capacity. Moreover, many current AI applications are relatively new and unproven, making it hard for research project managers to evaluate their effectiveness or accuracy.

Staffing challenges can also compound some of these knowledge gaps. A program manager found that when s/he could not be a resource for new hires on the topics of AI and DS, junior staff were less likely to ask about new approaches or advocate for them. Given that junior research engineers who do have the knowledge and experience to explore these topics are not likely to continue working in an environment where they cannot advance their skills, Turner-Fairbank may face an AI and DS talent flight risk.

All interview participants expressed an interest in learning more about the field of AI and DS as it relates to the transportation sector. Those who currently engage with the topic have mostly learned by reading publications, self-teaching coding, or watching webinars or online videos. Some people can spend limited time attending conferences or general training such as what the General Services Administration (GSA) provides.

Given their workload, it has been and will continue to be **challenging for Turner-Fairbank staff to find the time to dedicate to learning about AI and DS**. To address this, some interview participants suggested that with leadership support, they will be more likely to attend workshops and training as part of their job requirement. Having Turner-Fairbank-wide training requirements would also connect colleagues across different teams and research projects. This can help facilitate an organic knowledge exchange and make it easier to recycle ideas and tools which different disciplines can leverage.

Managers are most interested in learning about all the different AI and DS tools that are available, as well as how others in the industry are using them. A sentiment that frequently came up was “**we don’t know what we don’t know**,” which has made it challenging for research offices to explore new techniques and applications that can enhance their work. Interview participants mentioned that it would be helpful to learn where others in the industry are failing when it comes to AI and DS applications.

In addition to needs and challenges, the Project Team also asked all interviewees about their vision for AI and DS expertise in terms of staffing at Turner-Fairbank. There was general agreement that training and resources should target Federal employees rather than contractors so that the Federal workforce at Turner-Fairbank can start to build institutional knowledge and expertise on this topic. In addition, **many would like to see more multi-disciplinary data scientists** on staff to help showcase the different benefits of AI and DS and improve DS dexterity among new staff. Most were relatively agnostic about where they would like Turner-Fairbank to position the data scientist, as long as that person can provide support at various points in a project’s life cycle, including evaluating proposals and deliverables, overseeing extramural research and validating contractor work, and being able to offer different tools and approaches on a project.

3.1.3 Takeaways

Based on the interview results, the Project Team identified four different personas at Turner-Fairbank, each of which is a broad category that frames the **type of learner who will use the DSP and how they can most use the DSP to support their work**. Table 3⁴ describes each persona by its typical responsibilities, background, and job title. Due to their proximity to research projects and the nature of their work, R&D Project Managers (who oversee external R&D teams) and Research-ready Project Managers (who oversee external teams and sometimes conduct analyses as part of the R&D team) will be the focus personas of the DSP. The DS/ML/AI knowledge needs of the other two personas (Staff or Process Manager & Administrative Support) are assumed to be less technical, such that the introductory parts of the DSP developed here will likely meet many of their needs. A follow-on effort could test this assumption and, if needed, develop additional materials to support their specific needs.

⁴ For improved coherence of this report, the personas listed in the table benefit from inputs received during the pilot testing, which is documented later in the report. This step allows the report to refer to only one set of personas, rather than describing their incremental evolution.

Table 3. DS Knowledge Needs-Based Personas at Turner-Fairbank

Persona	Typical responsibilities	Typical background	Typical Job Titles
R&D Project Manager	Develop R&D projects and oversee external R&D teams <ul style="list-style-type: none"> • Identify research needs • Develop statements of work • Review proposals • Advise R&D teams • Review deliverables • Plan for transition of research products to appropriate users/audience 	STEM education Human factors education (psychology or human behavior, experimental design, and statistics training)	Research Project Manager Team Lead Program Manager
Research-ready Project Manager	As above, plus sometimes conduct analyses as part of the R&D team	STEM education Human factors education (psychology or human behavior, experimental design, and statistics training)	Research Engineer Research Civil Engineer Research Psychologist
Staff or Process Manager	Manage the processes and people that enable Turner-Fairbank to execute its core mission: R&D	STEM and non-STEM education	Office of Research Services personnel Office Directors in HRDI and HRDO
Administrative Support	Operate or support internal processes that keep Turner-Fairbank running smoothly.	Non-STEM education	

There is a **genuine interest in learning more** about AI at Turner-Fairbank, but the appropriate level and specificity of the training will largely depend on the nature of a staff member's role. Program Managers and Team Leads would likely benefit from generalized topics that can help them understand how they and their team can evaluate project proposals and deliverables, whereas Research Project Managers might value training that introduces different approaches and how a project might apply them.

Given the nature of their role, while R&D Project Managers should stay up to date on different emerging practices, **they will not need in-depth training** on how to use methods and technologies. More specifically, 1) they may benefit from having reliable methods, such as a framework or benchmark for assessing the work of contractors, and 2) they may need specific expert support for evaluating proposals involving AI and DS. Due to their limited spare time, Program and Research Project Managers may benefit from limited short period training on the latest trends in the field of AI.

On the other hand, Research-ready Project Managers at Turner-Fairbank would likely benefit from training in data collection, data cleaning, automated algorithms, and data analytics methods. This user group should have access to **tailored, frequent, and longer training sessions**. Ideally, participants should

be able to immediately and directly apply to an existing project the skills and knowledge that they gather from training sessions so that they can continue to practice; this may eventually include specialized AI development space that offers Graphics Processing Units (GPUs). Additionally, as they may need more detailed and up-to-date knowledge than their managerial counterparts, **Research-ready PMs may be able to serve as on-call DS experts** to advise others at Turner-Fairbank.

In general, Turner-Fairbank personnel will likely have unpredictable needs which they can address if they have ready **access to training, workshops, and other resources as necessary**. AI, DS, and ML tools and the underlying methods/algorithms will continue to evolve. Similarly, the problems to which the tools are applied will change. Moreover, the full range of methods and tools and applications is already so diverse and wide that providing holistic and comprehensive training is simply infeasible.

Drawing from the above, a DSP that can meet stakeholders' knowledge needs should involve a combination of three approaches:

1. General training to provide foundational knowledge
2. Specialized training on applications, tools, and/or underlying methods and algorithms, and
3. Access to a small number of designated AI or DS experts who can advise on specific questions.

3.2 Phase II: Developing a Model for Meeting Turner-Fairbank Needs and Building Capacity

In Phase II, the Project Team drew on the takeaways from Phase I To develop a prototype DSP that can be tested in Phase III. The prototype DSP consisted of:

- A. A course recommendation system that guides users to appropriate training at two levels:
 - 1) general/fundamental and 2) specialized, and
- B. An expert advising system through which participants can receive individualized, task-specific guidance on DS, ML, and AI.

For context, the overall process of developing the DSP, which spans Phases I, II, and III, is illustrated in Figure 2. Phase II is depicted in two blocks: “Analyze training landscape” and “Develop prototype materials.” Everything to their left is in Phase I, and everything to their right is in Phase III.

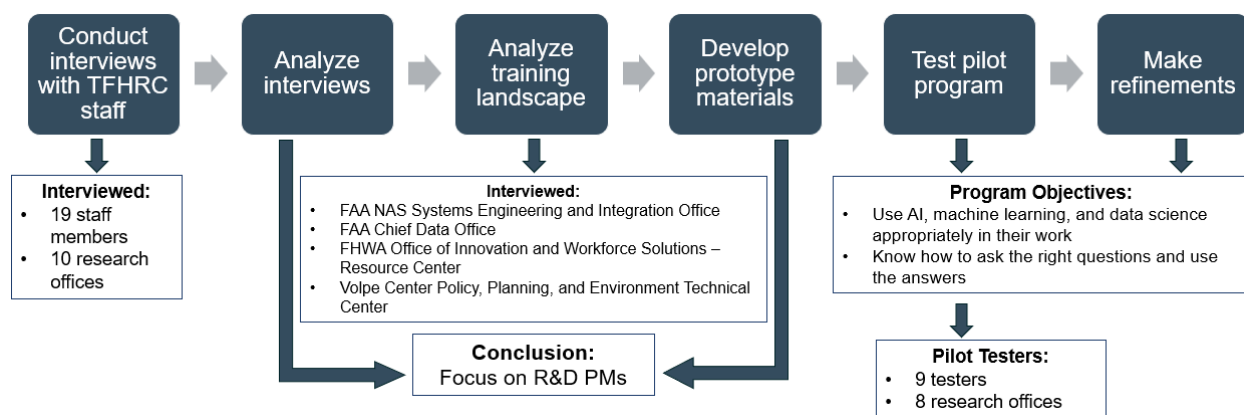


Figure 2. Process of DSP Development

3.2.1 Methods

To solidify background knowledge to support the design of the prototype, the Project Team reached out to subject matter experts (SMEs) with experience in program evaluation, capacity building, or managing AI trainings. Inputs received in those SME interviews are presented in Section 3.2.2 below; those inputs were used to guide other steps described in this present section on methods.

For the course recommendation system, the Project Team decomposed it into two parts:

- A course catalog, with sections for Foundational and Supplementary courses, and
- A course review system, including a form that students use to provide feedback plus a mechanism for others to review that feedback as they consider what courses to take.

Figure 3 depicts how the Project Team approached the course catalog so that it can meet the topics that stakeholders highlighted in Phase I. Under Foundational Courses, the Project Team identified three courses to help the R&D Project Manager and the Research-ready Project Manager personas familiarize themselves with key terms and concepts so that they can know the right questions to ask, where to investigate further, and how to parse the answers that they find.

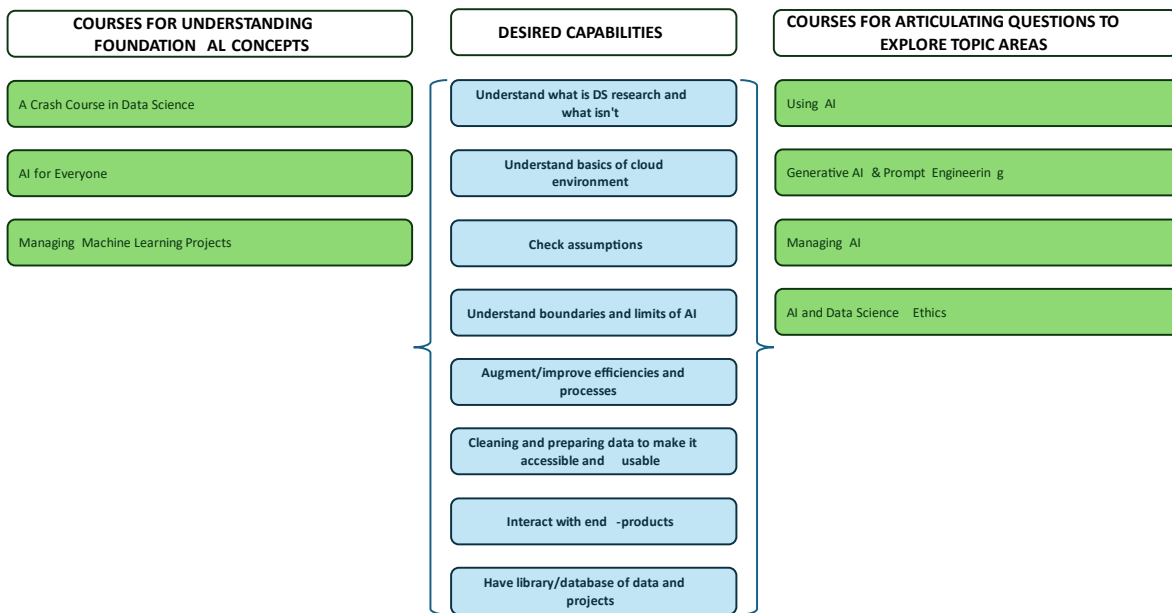


Figure 3. AI and DS Course Topics Linked to Interviewees' Desired Capabilities

For the core of the course recommendation system, the Project Team developed a course catalog of online training materials sourced from different academic institutions and massive open online courses (MOOCs). Inevitably, there were courses both across different platforms and within the same platform whose topic and curriculum overlapped with one another. Final selection for inclusion into the catalog came down to how much objectives overlapped with other courses under a *different* topic and whether the curriculum had something *additional* to offer.

Rounding out the course recommendation systems is a Course Assessment Tool using an online form—see Appendix E. This Course Assessment Tool gathers feedback from those who have taken a course and provides it to those who might consider taking it. The intention is that the course reviews by Turner-Fairbank staff can add useful, context-specific feedback for other Turner-Fairbank staff, complementing the course reviews that are created by the entire global population of people who have taken a course and posted their review on online platforms such as Coursera and edX.

3.2.2 Findings

As noted above, the Project Team conducted interviews with SMEs experienced in program evaluation, program management, and AI capacity building. Table 4 summarizes the key findings that informed the development of the prototype DSP and the plan for the pilot testing described in Section 3.3.

Table 4. Highlights from SME Discussions to Shape DSP Prototype and Pilot Testing

SME Office	Highlights
Volpe Center Policy, Planning, and Environment Technical Center	<ul style="list-style-type: none"> • Be intentional about a healthy combination of variables that are important to this program: excited vs not excited, little exposure vs no exposure, mixture of staff levels, etc. • Prepare materials in different formats to give people different ways of consuming resources • Everyone will need to understand the basics. Define “the basics” • Bite-sized and short-form videos can be just as informative
FAA National Airspace System (NAS) Systems Engineering and Integration Office	<ul style="list-style-type: none"> • At the essentials level, non-STEM learners can just focus on familiarizing themselves with key terms • Program participants reported that a 5-month training program is too long • There is no shortage of interest in an AI training program with hands-on experience
FAA Chief Data Office	<ul style="list-style-type: none"> • This office is also in the exploration phase for developing an AI training program • This office has identified a gap in AI governance
FHWA Office of Innovation and Workforce Solutions – Resource Center	<ul style="list-style-type: none"> • State and Local governments do not appear to fully understand the difference between AI and ML • The Resource Center is also unclear about AI governance • When the Resource Center is unable to match a researcher with an SME that can help, it will help the research with putting together a bid package and provide support throughout the life of the project

In developing the course catalog, the Project Team identified four primary constraints related to its conception of the intended users: pricing, programming prerequisites, level of effort, and applicability or relevance. The Project Team applied these primary constraints and selected 22 courses for the catalog, narrowed down from the more-than-3,000 courses available online. Table 5 summarizes the key findings that emerged as primary constraints.

Table 5. Constraints on Selections for Course Catalog

Issue	Constraint
Pricing	Free
Registration Complexity	Low
Flexibility	Asynchronous & self-paced; 8-20 hours to complete
Cultural Context	U.S.-based providers preferred

To ensure that **cost** is not a barrier to learning and professional development, the Project Team determined that it was important to consider training opportunities that are free of charge or are within a reasonable budget. Eliminating the price barrier also allows staff to approach the DS program more casually without limiting their learning due to budgetary restrictions.

Because there is a wide range of research offices and staff within Turner-Fairbank, there might also be a wide range of permissions and clearances before signing up for external courses. Therefore, the DSP should only recommend platforms with simple and **straightforward registration**. Registration should not require supervisor approval or additional requests through the IT Department.

Turner-Fairbank research engineers and managers report a lack of time to spend on optional training. As such, training opportunities should be **flexible** and not require the same kind of scheduled attendance typically found in formal institutional settings. For example, courses in the catalog should be asynchronous and self-paced. To accommodate the different levels of availability of teams across Turner-Fairbank, there should be a mixture of stand-alone modules and sequential courses that build on the foundational training. Individual courses in the catalog can range between 8 to 20 hours to complete.

International schools may involve concepts or limitations that do not apply to the US, and USDOT by extension. For example, data privacy protections in the European Union (coming principally from the General Data Protection Regulation [GDPR]) are stricter and are not applicable to US developers that do not involve European users. Courses that are hosted by international schools must demonstrate generalized practices that can be applied to **the US context**.

3.2.3 Takeaways

Findings from the SME discussions, combined with the primary takeaways from Phase II stakeholder interviews, point to a need for a DS program that is **both tailored and generalizable in approach**. For example, while managers would benefit most from foundational training and AI exposure, research engineers should have access to foundational training *as well as* resources specific to using different types of research techniques. Moreover, due to the wide spectrum of expertise, experience, and training at Turner-Fairbank, no two research engineers are identical in the work that they perform.

While personas in Table 3 can capture the similarities between different roles at Turner-Fairbank and can inform a generalized approach for training a large audience at once, it is also important to recognize that even though two engineers might share the same title, their background might greatly differ. This observation supports the need for the DSP to **develop a tiered approach: foundational training and supplementary training**. Foundational training should be accessible and easily digestible for all learners so that they may arrive at a minimum baseline understanding of key concepts. On the other hand, supplementary training can offer technical and in-depth courses that can satisfy the more specific needs of Turner-Fairbank staff members.

3.3 Phase III: Piloting an Approach to Meeting Turner-Fairbank Needs

Phase III centered on pilot tests of the course recommendation system and expert advising service. That work is described in this section. It also included a study of options to encourage the use of DS skills, which is described in Section 3.4.

3.3.1 Methods

The first step in conducting pilot testing was to recruit testers. Table 6 indicates the distribution of pilot testers across Turner-Fairbank's offices. The Project Team sought to create a cohort that covered the entirety of HRDI and HRSO and included diversity in role and interest in DS/ML/AI, though high-interest staff members are probably overrepresented in the pilot testing cohort relative to Turner-Fairbank's entire complement of research staff. The Project Team engaged the cohort members' supervisors to validate and refine the selections.

Table 6. Pilot Testers' Team/Office

Team/Office	Role
HRDI-20 Infrastructure Analysis and Construction Team	Program Manager
HRDI-20 Infrastructure Analysis and Construction Team	Research Engineer
HRDI-30 Long-Term Infrastructure Performance Team	Research Engineer
HRDI-40 Bridge Engineering Research Team	Research Engineer
HRSO-10 Roadway Team	Research Engineer
HRSO-20 Safety Data & Analysis Team	Research Specialist
HRSO-30 Human Factors Team	Team Lead
HRSO-40 Transportation Enabling Technologies Team	Research Engineer
HRT-10 Research Innovation Management Team	Program Manager

Next, the Project Team introduced the testing cohort to course materials for the pilot program: Baseline Survey, Course Assessment Tool, Course Catalog, and Course Glossary. After briefly skimming the Course Catalog, each pilot tester completed a Course Ranking Form to help the Project Team determine how to assign the first set of training courses. To ensure all courses benefit from the same number of auditors and that the cohort is not encumbered by lengthy training, the Project Team asked that testers spend up to two hours on their assigned courses, though learners were encouraged to go beyond that expectation if they were keen on doing so.

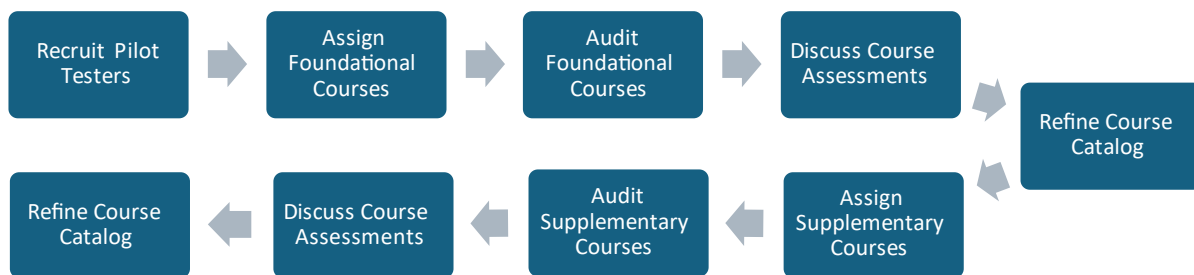


Figure 4. Course Vetting Process

The Project Team and the testing cohort met monthly between November 2024 and February 2025, using these monthly discussion meetings as regular touch points to assess testers’ progress with their course assignments and share observations. The ability to regularly engage with testers while developing and refining program materials allowed the Project Team to incorporate valuable input not only for training courses, but also for the overall DSP and for its potential rollout.

The Project Team also introduced an expert advising service, in which pilot testers would have access to AI and DS experts at the Volpe Center who can provide tailored support. Ad hoc AI expert services provided flexibility for various needs. For example, when an R&D Project Manager might need to interpret language about AI in a contractor deliverable, an expert can help with making sense of such products. Likewise, an R&D Project Manager in the process of developing a project scope might seek an AI expert who can recommend training materials to better understand the parameters of the research task.

3.3.2 Findings

3.3.2.1 Baseline Survey

The Project Team used inputs gathered through the Baseline Survey to understand the distribution of AI experience among pilot testers. It also gathered feedback on the Baseline Survey from pilot testers to identify refinements that would serve the broader Turner-Fairbank user base.

Table 7. Pilot Testers' Training Goals

What are you hoping to learn through your training?
<ul style="list-style-type: none"> • I am trying to go into this with an open mind. • I am hoping to develop a solid understanding of the basics of AI, ML, and DS, including the associated methods, techniques, and tools. • I hope to get a better understanding of the capabilities of AI and ML, and what it can and can't be used for. • I want to develop a strong foundation. This area is moving so fast that for me—the foundation should provide us with the questions to ask, responses to look for, and 'look out for'. • I want to learn all the basics of AI, and how to develop AI models to do what I need them to do. • I want to learn how to use AI in my field of work. • I want to improve my understanding of AI based techniques that I can incorporate into my research and provide valuable insight when reviewing work by others. Also learn about resources that are currently available. • I want to better understand AI and related subjects and how to employ them in our research. • I want to understand what types of information are necessary to support AI in highway transportation. • I want to learn more details about AI fundamentals and tools.

3.3.2.2 Course Assessment

Testers' assessments of Foundational courses are summarized in Table 8; assessments Supplementary courses are in Table 9. Testers who reviewed the same courses generally shared similar sentiments about the course contents. Note that comments on some courses were generally negative, and that not all courses reviewed in this step were included in the course catalog in Appendix D. Courses that did not survive this step are marked with an asterisk (*).

Table 8. Foundational Courses: General Assessment

Course	Comments
AI for Everyone	This was a very helpful intro to AI and got me excited to learn more about the topic area.
Crash Course in Data Science	I enjoyed this short course and gave me a good foundation (along with the AI for Everyone short course) to learn more about AI, machine learning, and data science.
Data and AI Fundamentals*	I personally am clearly not the target audience of this type of content. For me, the course may be succinctly summarized as: "We want to make you aware of the existence of this website: https://landscape.lfai.foundation/ ."
Managing Machine Learning Projects	(1) The concepts discussed are intuitive and follow general project management fundamentals so was easy to follow and understand though not familiar with the specific aspects of managing ML project management. (2) I think this course is beneficial for Turner-Fairbank staff at all levels ...However, a pre-requisite of basic knowledge of AI and ML is needed as the instructor is assuming the learner is familiar with the basics...

* This course was removed from the course catalog.

Table 9. Supplementary Courses: General Assessment

Course	Comments
Generative AI: Fundamentals, Applications, and Challenges	This was good for understanding the big picture of GenAI and as an introduction to the topic . The presentation was straightforward to the point, well structured , well sequenced. Covers relevant topics at basic level.
Machine Learning for All*	<ul style="list-style-type: none"> • This is good as an absolute beginner introduction, but best as a quick rapid introduction. • The course topic is not commonly needed for physical measurement sciences. • Concern that a typical Turner-Fairbank researcher would not have actionable takeaways from training and overall utility for Turner-Fairbank may be low.
Managing Machine Learning Projects	<ul style="list-style-type: none"> • Concepts in line with general project management fundamentals so it was easy to follow. • Beneficial for Turner-Fairbank staff at all levels but a base familiarity with AI/ML is needed.
Prompt Engineering and Advanced ChatGPT*	<ul style="list-style-type: none"> • This training seems to be less useful due to structure/presentation. • The presentation itself seems difficult to navigate; more detail on course outline is desired. • Examples were not relevant to research but techniques are applicable.
The AI Ladder: A Framework for Deploying AI in your Enterprise*	Concepts in framework are potentially applicable , but the most prominent theme seems a bit more geared towards business enterprising/operations .
Trustworthy Generative AI	Material was presented in a straightforward and accessible way but it was more about ways to use AI to make it more trustworthy. Topics useful and practical.

* This course was removed from the course catalog.

3.3.2.3 Expert Advising Survey

The Project Team invited pilot testers to use the prototype Expert Advising Pilot Service, but no tester did so. Nonetheless, some testers did respond to a survey about the service's potential utility. Results of the survey are found in Table 10.

Table 10. Pilot Testers' Vision for Using Expert Advising Service

Where in your workflow and with which areas would you like expert input? How would you like to work with the expert advisor to address your concerns?
<ul style="list-style-type: none"> Enhance the user experience of InfoHighway web portals. The sheer volume of information can overwhelm researchers, making it challenging to efficiently navigate and identify relevant datasets, studies, or literature materials. I want to potentially enhance the user experience, helping researchers quickly access relevant resources and connect with experts working on similar topics to improve efficiency and research impact. I was going to run such ideas by the experts for further discussion, then refine those ideas for serious consideration if we see that the ROI worth the level of effort. It would be helpful to have an expert to bounce ideas off of to see if AI and ML methodologies and tools could be incorporated into new projects. This integration could be in the scope of work, as well as in the evaluation of work products and deliverables.

3.3.3 Takeaways

The Project Team initially intended to measure the baseline knowledge of the pilot testers and compare that data with the results from an exit survey. However, as the pilot program progressed, the team found that rather than measuring “knowledge increase,” Turner-Fairbank would better benefit from an evaluation of **whether courses were engaging, interesting, and readily applicable to their own work.** However, the baseline survey did serve a purpose, in that it provided additional data for understanding the wide levels of experience and comfort with using AI across various research teams at Turner-Fairbank.

Pilot testers’ responses about what they hope to accomplish through the DSP also provided additional context for their responses in the Course Assessment Tool. These responses support the initial goal of the DSP, which is to help researchers and managers develop the foundation for understanding key concepts so that they can better know **“the questions to ask, responses to look for, and look out for.”** These findings also highlight the appetite that at Turner-Fairbank to develop the comfort level and ability to better **leverage AI tools and techniques to improve efficiency in the workflow.**

Assessment responses on course contents emphasized the **importance of a two-tiered approach to training materials:** generalized and foundational training that is accessible to those with and without STEM backgrounds, and more specialized courses that build on the foundational knowledge. For example, those who audited “*Managing Machine Learning Projects*” and expressed that they would recommend the course. However, they also observed that learners of this course would require a base familiarity with AI and ML, which they can satisfy through one or more of the Foundational Courses.

Beyond content, it is also important to **consider course presentation and the learner experience.** Courses which the Project Team identified as informative and relevant did not automatically translate into an engaging experience for pilot testers. For example, while in its initial auditing, the Project Team found that “*Prompt Engineering and Advanced ChatGPT*” straightforward and illustrative, pilot testers found the structure not useful and **“difficult to navigate.”** The findings from this participatory and multi-

level vetting process for course materials stress the value and importance of end-user feedback before official implementation.

3.4 Developing Approaches to Encourage DS Use

In addition to the effort to meet DS/ML/AI training needs at Turner-Fairbank through the prototype development and testing described in Sections 3.1-3.3, the Project Team ran a process to develop a prioritized list of candidate actions that Turner-Fairbank might take to encourage its staff to use the DS/ML/AI skills that the training delivers. This effort was to address the real possibility that providing only training would not be sufficient to shift behavior across Turner-Fairbank.

3.4.1 Methods

The Project Team identified three innovation specialists at the Volpe Center to confer with the Chief Scientist. This group of four met twice, with the Volpe Center specialists drawing information from the Chief Scientist on questions such as:

1. Help us understand the need. What evidence have you seen that training alone will not be enough to deliver appropriate, consistent, and thoughtful use of DS skills at Turner-Fairbank?
2. What other upskilling and/or behavior-shift efforts have Turner-Fairbank hosted in the past? To what extent were they successful, and why? How did Turner-Fairbank respond when “big data” captured the community’s imagination and energy roughly 10 years ago?
3. What barriers do you see at Turner-Fairbank that might tend to inhibit experimentation with DS?
4. What assets exist at Turner-Fairbank to support a Center-wide campaign to shift behaviors? For example, are there centralized institutions or center-wide communications services and practices.

The Volpe Center specialists conferred offline, analyzed inputs from the Chief Scientist, and developed draft recommendations.

3.4.2 Findings

The discussions and analysis uncovered a rich set of findings about the context within which Turner-Fairbank might make efforts to encourage the use of DS, ML, and AI. Table 11 summarizes the most important findings.

Table 11. Challenges and Opportunities Related to Encourage DS Use at Turner-Fairbank

Challenges & Issues to Address	Opportunities & Assets to Leverage
<ul style="list-style-type: none"> • Turner-Fairbank leaders have many competing priorities—time available for new initiatives is limited. • The costs of taking risks on novel methods tend to outweigh apparent benefits. • Turner-Fairbank does not have widely used infrastructure for DS experimentation. • Turner-Fairbank’s organizational structure for project planning is decentralized. There is little precedent or infrastructure to support systematic shifts in methods. 	<ul style="list-style-type: none"> • The Data Science Task Force, currently quiet, could be a platform for cross-Center actions. • PANDA and the emerging DOT-wide Advanced Research & Testing (ART) Network can provide space for experimenting with DS. • Entering a time of reduced funding and staffing may provide an incentive to find more efficient methods. • The DOT chatbot, chat.dot.gov, is now available to beta testers. • There are existing cross-Center communications: weekly emails and quarterly all-hands meetings. • The Turner-Fairbank Long-Range Plan is under development and includes a discussion of DS.

3.4.3 Takeaways

The conversations with the Chief Scientist and subsequent analysis led the innovation specialists to identify a set of actions that appear most promising as far as encouraging the use of DS, ML, and AI at Turner-Fairbank. The actions are enumerated in the list below. Notably, there is no low-hanging fruit in the list; rather, there are some small and some larger steps that may combine to result in substantial organizational change. As others have noted, culture change is hard.

Candidate actions to encourage DS use at Turner-Fairbank:

- **Cultivate additional champions among Turner-Fairbank leadership.** Making changes in Turner-Fairbank processes that will support a Center-wide shift in behaviors will require sustained and broad though not necessarily massive investments. For example, featuring DS/ML/AI regularly in Center-wide communications or providing small incentives for DS/ML/AI innovators are inexpensive ways of supporting behavior shift that would be strengthened by support from Turner-Fairbank leadership. For the longevity and consistency of behavior shifts across the organization, clear signals from leaders to all Turner-Fairbank staff of leaders’ solid commitment will be critical to enable staff engagement.
- **Reconstitute the Data Science Task Force.** Having a small community of advocates that can support each other and advise on initiatives to drive DS use will be indispensable. This is the group that can create and refine the proposals that DS-supportive Turner-Fairbank leaders can approve. Consider inviting Data Science Task Force members to beta test the DS course catalog and tools.
- **Emphasize and solidify the role of DS in the Turner-Fairbank Long-Range Plan.** The Long-Range Plan, under development at the time of the group’s discussions, provides an opportunity to

institutionalize support for expanded and appropriate use of DS. To the extent that the Long-Range Plan calls that out as a priority, future initiatives can lean on it for added credibility.

- **Discuss DS capabilities and needs at Turner-Fairbank quarterly meetings.** The Center-wide quarterly meetings provide an opportunity to educate the entire Turner-Fairbank staff regarding DS assets, including PANDA, the emerging DOT-wide AI/ML/DS sandbox called the ART Network, the presumably reconstituted DS Task Force, and the Data Science Program whose development is described in the present document. More importantly, the Center-wide meetings are a natural venue for Turner-Fairbank leadership to set the expectation that staff will use appropriate DS approaches in their work, using the assets noted above.
- **Publicize innovative uses of DS/ML/AI at Turner-Fairbank.** A powerful way to encourage DS experimentation is for staff to hear of peers' successes and less-than-successful attempts, and to see Turner-Fairbank celebrating both successful and unsuccessful efforts. This is a core principle that animates the Volpe Center's Volpe Innovation Accelerator (VIA), in which teams are invited to spend up to 40 hours creating and testing new concepts that may be transportation- or business process-focused. VIA's combination of vocal leadership support; efforts to encourage focused, small-scale innovation; and Center-wide celebration of efforts, participants, and outcomes could provide a useful model for a Turner-Fairbank program to encourage DS innovation. The existing Turner-Fairbank Center-wide weekly emails can support the internal outreach necessary for such a program.

4. Conclusions

In the work described here, the Project Team attempted to equip Turner-Fairbank leadership with the tools necessary to increase average skill in DS, ML, and AI across all staff, and especially for those staff members who most need it to perform their work effectively. Interviews and focus group discussions made it clear that there is a clear sense of a need for more knowledge in DS, ML, and AI, and an interest in learning and using up-to-date information.

To address the need, the team, which included an instructor of AI and an adjunct professor of engineering mathematics, interviewed Turner-Fairbank staff as well as SMEs in program evaluation, survey design, and hands-on AI advising of FHWA and DOT staff. The team analyzed the results of those interviews, considered free online training options, and developed and tested a prototype program for data science upskilling.

In the process, the team uncovered principles that guided this work and should guide future updates to the data science upskilling program. These principles are summarized below.

Principles for DS/ML/AI Training Delivered Anywhere

- Structure
 - Plan on having a foundational level: Everyone needs to know the basics.
 - Consider AI coaches.
 - Find and use reliable course providers. The AI training landscape is massive and diverse, so outsourcing course selection & quality assurance to some extent is critical.
- Format
 - Consider short-form videos. YouTube is a great resource.
 - Take care to address the dimensions of enthusiasm & background for an audience with different backgrounds.
 - Use multiple formats to serve different learning styles.
 - Five months is too long for a course.
- Training Needs
 - For non-STEM learners, learning terminology is a good start and might be enough.
 - We have seen strong interest in AI training that includes hands-on experience.
 - There is a gap in knowledge on AI governance.

Additional Principles for DS/ML/AI Training at Turner-Fairbank

- Audience
 - Focus on R&D project managers.
 - Include the capability to **conduct** R&D in that conception.
- Training Needs
 - Include algorithm development.
 - Include data pipeline management.
 - Include when to use AI: capabilities and limitations.

- Integration
 - Introduce the community to AI advising and the program overall with informal lunchtime session(s).
 - Use impact metrics and continuous improvement mechanisms to help secure leadership support.
 - Ensure access to computing resources so students can use new skills.

This report can be the blueprint for a prototype program for DS upskilling. Note, however, that this DS upskilling program cannot be static. **Critically**, it must focus on the users, respond to their feedback, and evolve as technologies and methods in DS, ML, and AI evolve.

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Appendix A. Turner-Fairbank Staff Interview Questions

Questions for Group Meetings with Chief Scientist

- Do you have an AI benchmark for assessment?
- Are there any barriers?
- Do you need help with data cleaning or choosing an algorithm?

Questions for Interviews with Volpe Center

Background and your AI/DS use cases

- Could you tell me about your work, particularly as it pertains to data science or AI? What DS/AI techniques are you working with and how are they applied to your work?
- What work does your team do that seems to utilize AI/DS the least? Why do you think that is?
- Where in your work have you noticed that a lack of background in AI/ML/DS has presented challenges? Or maybe in colleagues' work of which you're aware?

Using AI/DS knowledge in your work

- How do you think AI/DS knowledge plays into your daily work? How **should** it play into your daily work?
- How do you know when a contractor is likely to go down the wrong road with use of AI/ML in your area?

Your current practices for data science/AI knowledge gathering

- How do you stay up to speed on what's happening with AI/ML in your domain?
- Have you ever attended a formal training on AI/DS? Would you if it were available?

What Turner-Fairbank could do to better support AI/DS use in research

- What's one thing about AI/DS you wish more people at Turner-Fairbank knew?
- If you had another 2-3 hours a month to spend expanding your AI knowledge, how would you want to spend that time? Trainings/webinars, following the news, sharing insights with peers
- What kinds of support would you like from your manager, team, or staff so that you can better use AI/DS tools and knowledge in your work?

Appendix B. Highlights from Initial Turner-Fairbank Interviews

Team/Office	Could you tell me about your work, particularly as it pertains to data science or AI?
HRDI-10	<ul style="list-style-type: none"> Have part-time consultants in labs who do predictions Previously had post-doc a few years ago but currently no capacity to use/create dashboards
HRDI-20	<ul style="list-style-type: none"> Post-doc and contractors using AI/ML Not sure what tools are being used
HRDI-40	<ul style="list-style-type: none"> AI is used at the end to make data useable by States We're mostly on the DS side of AI
HRSO-20	<ul style="list-style-type: none"> Only manages project, doesn't use AI himself
HRSO-30	<ul style="list-style-type: none"> Interact with product after gone through AI apps
HRT-10	<ul style="list-style-type: none"> Tech transfer – how to take work from Turner-Fairbank projects and transition results Filling research associate positions for data scientists has been difficult

Team/Office	Where in your work have you noticed that a lack of background in AI/ML/DS has presented challenges? Or maybe in colleagues' work of which you're aware?
HRDI-10	<ul style="list-style-type: none"> Wanted to do a project overhaul but because didn't have dexterity, didn't realize it's such a huge undertaking
HRDI-40	<ul style="list-style-type: none"> People need to better understand limitations of AI in engineering field Need to better understand what it cannot do and should not do
HRSO-20	<ul style="list-style-type: none"> What is DS research vs what isn't What is the governance Not understanding basics of cloud environment
HRSO-30	<ul style="list-style-type: none"> Apps currently in use are relatively new and not proven Generally assume AI doing what we want it to do
HRSO-40	<ul style="list-style-type: none"> Don't understand enough about algorithms to offer input on approaches
HRSO-50	<ul style="list-style-type: none"> Tons of data but no tools/ability to simply analyze No way to check out assumptions
HRT-10	<ul style="list-style-type: none"> Difficult to assess research products/programs due to lack of downstream info

Team/Office	How do you think AI/DS knowledge plays into your daily work? How do you know when a contractor is likely to go down the wrong road with use of AI/ML in your area?
HRDI-20	<ul style="list-style-type: none"> No problem supervising. Understand enough of discipline to know boundaries and limits
HRDI-40	<ul style="list-style-type: none"> Litmus test - contractor must be able to explain exactly and succinctly problem they are trying to solve
HRSO-50	<ul style="list-style-type: none"> Doesn't feel equipped to provide critical feedback on use of AI/ML
HRT-10	<ul style="list-style-type: none"> Bringing in outside experts

Team/Office	How do you stay up to speed on what's happening with AI/ML in your domain?
HRDI-20	<ul style="list-style-type: none"> No time
HRSO-02	<ul style="list-style-type: none"> Self-teaching python
HRSO-10	<ul style="list-style-type: none"> YouTube
HRSO-20	<ul style="list-style-type: none"> Conferences Learning through projects
HRSO-30	<ul style="list-style-type: none"> Self-teaching python
HRSO-40	<ul style="list-style-type: none"> Learning from colleagues Stanford trainings, conferences
HRSO-50	<ul style="list-style-type: none"> Research papers, webinars

Team/Office	What's one thing about AI/DS you wish more people at Turner-Fairbank knew? How would you like to expand your AI knowledge?
HRDI-10	<ul style="list-style-type: none"> • Micro-training • Regular webinars • Trainings to demonstrate capacity/abilities of AI/DS
HRDI-20	<ul style="list-style-type: none"> • Bi-/weekly trainings
HRDI-40	<ul style="list-style-type: none"> • Hands-on trainings • Week-long bootcamp type of workshop
HRSO-10	<ul style="list-style-type: none"> • More in-depth trainings • Learn from colleagues
HRSO-20	<ul style="list-style-type: none"> • Webinars every few months to get up to speed
HRSO-30	<ul style="list-style-type: none"> • Learn how other people are using AI/DS • Staggered trainings/stepwise program • Transportation-specific webinars

Team/Office	What are some of your goals or expectations for the use of AI at Turner-Fairbank?
HRDI-10	<ul style="list-style-type: none"> • Understanding the different roles and what education level needed for each role • Data scientists in consultant capacity
HRDI-20	<ul style="list-style-type: none"> • Better awareness of available tools and approaches • Limit trainings to Feds • Support to validate work of external contractors
HRDI-40	<ul style="list-style-type: none"> • Prefer to have Fed AI person directly in the project group (contractor to contractor collab is nightmare) • Understanding what the different tools can offer • Showcase benefits to change mentality • Standardizing machine-readable data
HRSO-02	<ul style="list-style-type: none"> • Improve DS literacy and dexterity among new staff • AI can help with program evaluation
HRSO-10	<ul style="list-style-type: none"> • Trying to see if AI can augment processes
HRSO-20	<ul style="list-style-type: none"> • Don't want just engineers to focus on it • Want more data scientists on staff • Having someone for proposal evaluation • Having someone to understand data and what you can do to extract information
HRSO-30	<ul style="list-style-type: none"> • Want to see where people are failing regarding use of AI • Have AI do exploratory work and actual defined projects • Cross-over expertise (across discipline) • Be prepared with backup if AI fails
HRSO-40	<ul style="list-style-type: none"> • Don't think it's feasible to have one person in each team to focus on AI. Would rather see a dedicated group of staff in a lab model to support all of Turner-Fairbank
HRT-10	<ul style="list-style-type: none"> • Ability to oversee extramural research • Difficulty filling and retaining research associateship program with people with data science background

Appendix C. Baseline Survey

TO DSP PILOT TESTERS: Baselineing participant familiarity with and knowledge of data science, both broadly and with specific techniques relevant to their field, is an important component of assessing the impact of the program. This step will help us identify and build out generalized training opportunities for all program participants.

Baseline questions before beginning the program:

1. What is your role?
 - ☐ Researcher or Engineer
 - ☐ Team Lead
 - ☐ Program Manager
 - ☐ Other _____
2. Explain the distinction between Artificial Intelligence (AI) and Machine Learning (ML), Machine Learning and Data Science (DS), Transformers and Large Language Models (LLM).
3. What is considered an AI tool? (choose all that apply)
 - ☐ Tableau
 - ☐ ChatGPT
 - ☐ Linear regression
 - ☐ Recommendation system
4. What is considered a Data Science approach? (choose all that apply)
 - ☐ Data analysis
 - ☐ Dimensionality reduction
 - ☐ Data aggregation
 - ☐ Triangulation of stochastics
5. What is an obtainable outcome using AI? (choose all that apply)
 - ☐ Prediction of accidents in 10 years.
 - ☐ Sentiment analysis of consumer complaints
 - ☐ Automation of low-level tasks well-suited with ML
 - ☐ Stop drunk driving
6. On a scale of 1-10, how well do you think you understand the basics of DS, ML, and AI?
7. What are you hoping to learn through your trainings?
8. **DSP PILOT TESTERS:** This question is only for you; it'll be removed before this goes out to all of Turner-Fairbank. What comments/suggestions do you have on this form?

The survey will *only* collect responses. Participants will not be provided the correct answers.

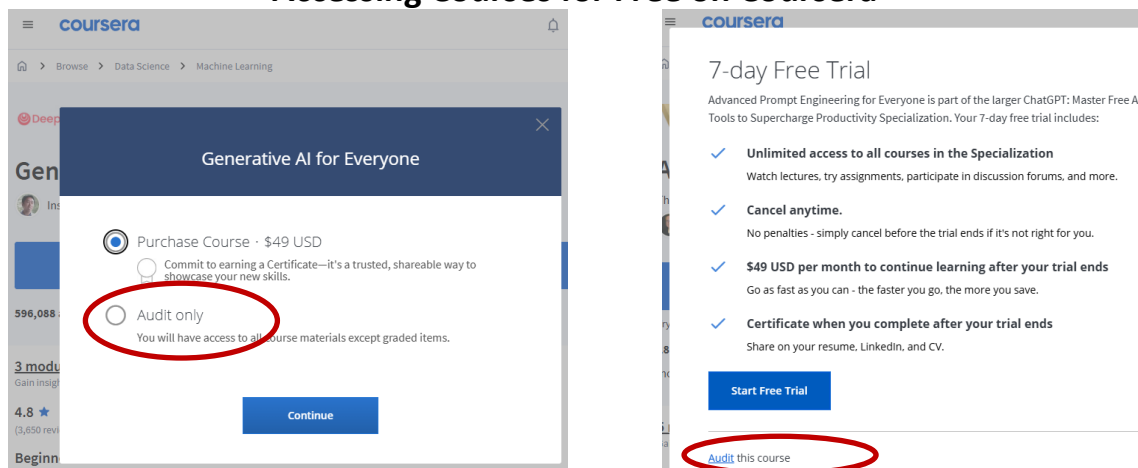
Appendix D. Course Catalog

This course catalog is a summary of foundational and supplementary data science (DS), machine learning (ML), and artificial intelligence (AI) courses that can be the initial core of the data science program for upskilling at Turner-Fairbank. These courses are available at no cost through online course providers such as Coursera, edX, and the Project Management Institute; no-cost courses generally exclude assignments.

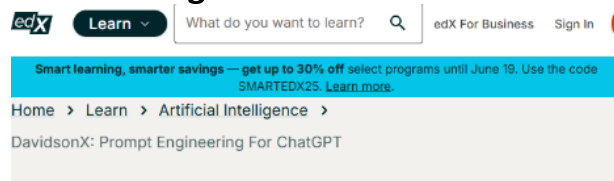
Usage notes:

- To access a course, right click the course title/heading below and select “Open Hyperlink.”
- To access free Coursera or edX materials, choose the [Audit](#) option. See screenshots below for examples of how to do this.

Accessing Courses for Free on Coursera



Accessing Courses for Free on edX



DavidsonX: Prompt Engineering for ChatGPT

4.4 ★★★★★ 39 reviews

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Advance your career

12,050 learners enrolled

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Table of Contents

Foundational Courses	35
A Crash Course in Data Science.....	35
AI For Everyone	36
Managing Machine Learning Projects.....	37
Supplementary Courses.....	39
Algorithms.....	39
Data Pipeline Management	40
Ethics	41
Generative AI	41

Foundational Courses

A Crash Course in Data Science

Course Summary: This is a focused course designed to rapidly get you up to speed in the field of data science. The goal is to make this as convenient as possible for you without sacrificing any essential content. Technical information is left aside so that you can focus on managing your team and moving it forward. This class is for anyone who wants to learn what all the data science action is about, including those who will eventually need to manage data scientists. This course is part of the [Executive Data Science Specialization](#).

Institution: Coursera – Johns Hopkins University

Commitment: 7 hours

What You'll Learn

- Describe Data Science's role in various contexts
- Understand how Statistics and Machine Learning affect Data Science
- Use the key terms used by data scientist
- Predict whether a Data Science project will be successful

Course Outline

- Introduction
- What is Data Science?
- What is statistics good for?
- What is machine learning?
- What is software engineering for data science?

- Structure of a data science project
- The output of a data science experiment
- Defining success
- Data science toolbox
- Separating hype from value

Comments from TFHRC/Volpe Course Reviewers

- Research Highway Safety Specialist, TFHRC - it seems to be a very basic course but good introduction and in terms of specific definitions- good review.
- Team Leader, TFHRC - This was a very useful and informative short course on data science.
- Project Team Lead, Volpe - Videos are engaging—like a *good* online class that might be taught live; appreciate the access to the transcript. I watched at 2X speed. I think I'd want to slow down and take notes if I were seeking to deeply absorb it. (I know much of this material already.) Offers a critical orientation for understanding role of DS and ML in research design, SOW dev. Overall assessment: likely value to TF R&D PMs is high.

AI For Everyone

Course Summary: This course requires six hours of effort and covers the most crucial topics, such as terminology, how to recognize when AI is suitable for a project, and how to manage an AI team. DeepLearning.AI offers specializations in AI for Good, Deep Learning, Machine Learning, and NLP that are worth considering.

Institution: Coursera – DeepLearning.AI

Commitment: 6 hours

What you'll learn

- The meaning behind common AI terminology, including neural networks, machine learning, deep learning, and data science
- What AI realistically can--and cannot--do
- How to spot opportunities to apply AI to problems in your own organization
- What it feels like to build machine learning and data science projects
- How to work with an AI team and build an AI strategy in your company
- How to navigate ethical and societal discussions surrounding AI

Course Outline

- What is AI?
 - Machine Learning•8 minutes
 - What is data?•11 minutes
 - The terminology of AI•9 minutes
 - What makes an AI company?•7 minutes
 - What machine learning can and cannot do•6 minutes
 - More examples of what machine learning can and cannot do•8 minutes
 - Non-technical explanation of deep learning (Part 1, optional)•7 minutes
 - Non-technical explanation of deep learning (Part 2, optional)•3 minutes

- Building AI projects
 - Workflow of a machine learning project•6 minutes
 - Workflow of a data science project•6 minutes
 - Every job function needs to learn how to use data•6 minutes
 - How to choose an AI project (Part 1)•7 minutes
 - How to choose an AI project (Part 2)•8 minutes
 - Working with an AI team•8 minutes
 - Technical tools for AI teams (optional)•6 minutes
- Building AI in your company
 - Case study: Smart speaker•9 minutes
 - Case study: Self-driving car•6 minutes
 - Example roles of an AI team•8 minutes
 - AI Transformation Playbook (Part 1)•10 minutes
 - AI Transformation Playbook (Part 2)•14 minutes
 - AI pitfalls to avoid•2 minutes
 - Taking your first step in AI•4 minutes
 - Survey of major AI application areas (optional)•16 minutes
 - Survey of major AI techniques (optional)•15 minutes
- AI and society
 - A realistic view of AI•7 minutes
 - Discrimination / Bias•9 minutes
 - Adversarial attacks on AI•7 minutes
 - Adverse uses of AI•4 minutes
 - AI and developing economies•7 minutes
 - AI and jobs•8 minutes

Comments from TFHRC/Volpe Course Reviewers

- Team Leader, TFHRC - The content was quite useful, and very easy to understand.
- Project Team Lead, Volpe - Top-notch lecture practices. Good intro/basic knowledge on ML concepts and overview of issues. Strong orientation value. Overall assessment: likely value to TF R&D PMs is high.

Managing Machine Learning Projects

Course Summary: This course walks through the keys steps of a ML project from how to identify good opportunities for ML through data collection, model building, deployment, and monitoring and maintenance of production systems. You will learn about the data science process and how to apply the process to organize ML efforts, as well as the key considerations and decisions in designing ML systems. This course is designed for managers, addressing the practical aspects of ML projects, and it helps to identify good opportunities for ML, which is very important at this phase of capacity building at Turner-Fairbank. The course offers a good mix of data science and ML. This is part of an [AI Product Management Specialization](#), which offers two more courses, and can serve as a more comprehensive training for those who can spend more time.

Institution: Coursera – Duke University

Commitment: 18 hours (videos can be run at 2X speed)

What you'll learn

- Identify opportunities to apply ML to solve problems for users
- Apply the data science process to organize ML projects
- Evaluate the key technology decisions to make in ML system design
- Lead ML projects from ideation through production using best practices

Content Outline

1. Identifying Opportunities for ML
 - a. Identifying Opportunities•7 minutes
 - b. Validating Product Ideas•5 minutes
 - c. Benefits of ML in Products•8 minutes
 - d. ML vs. Heuristics•5 minutes
2. Organizing ML Projects
 - a. ML Projects vs. Software Projects•6 minutes
 - b. CRISP-DM Data Science Process•13 minutes
 - c. CRISP-DM Case Study•17 minutes
 - d. Team Organization•9 minutes
 - e. Organizing the Project•6 minutes
 - f. Measuring Performance•7 minutes
3. Data Considerations
 - a. Data Needs•8 minutes
 - b. Data Collection•11 minutes
 - c. Data Governance & Access•6 minutes
 - d. Data Cleaning•9 minutes
 - e. Preparing Data for Modeling•9 minutes
 - f. Reproducibility & Versioning•8 minutes
4. ML System Design & Technology Selection
 - a. ML System Design Considerations•6 minutes
 - b. Cloud vs. Edge•10 minutes
 - c. Online Learning & Inference•8 minutes
 - d. ML on Big Data•3 minutes
 - e. ML Technology Selection•5 minutes
 - f. Common ML Tools•12 minutes
5. Model Lifecycle Management
 - a. ML System Failures•11 minutes
 - b. ML System Monitoring•9 minutes
 - c. Model Maintenance•7 minutes
 - d. Model Versioning•5 minutes
 - e. Organizational Considerations•3 minutes

Comments from TFHRC/Volpe Course Reviewers

- Research Engineer, TFHRC - The course is well-structured and broken into 5 modules discussed in order, and well connected. The course provides keys steps for ML project management and helps participants to understand and appreciate the process for identifying ML projects and understanding data science processes. An advanced course is probably required for managing actual ML projects.

- Research Team Director, TFHRC - Though the course included information about machine learning that was not new to me, it did not make the course seem long or overly basic.

Supplementary Courses

Algorithms

[AI and Machine Learning Algorithms and Techniques](#)

Course Summary: This course covers core algorithms and techniques used in AI and ML, including supervised, unsupervised, and reinforcement learning paradigms, as well as deep learning approaches. It emphasizes practical applications and the strengths and limitations of these techniques.

Institution: Coursera – Microsoft

Commitment: 42 hours (2.6h videos, 35.8h readings, 6.5h assignments)

Course Outline

1. Supervised learning
2. Unsupervised learning
3. Reinforcement learning and other approaches
4. Deep learning and neural networks
5. The concepts in practice

Comments from TFHRC/Volpe Course Reviewers

- Electronics Engineer, Volpe – The course materials were well-rounded and comprehensive. I would recommend this course to R&D staff at TFHRC. Somewhat long and detailed, uses Github, Python, and MS Azure; some quizzes.

[Deep Learning Specialization](#)

Course Summary: This is a set of courses that is recommended for those who have a strong math background and want to delve into the math underlying the methods. The Deep Learning Specialization was developed by DeepLearning.AI and is offered via Coursera and taught by Andrew Ng and two Coursera ‘Top Instructors’. Andrew Ng became famous in the educational domain of AI with his ‘Machine Learning CS229’ course at Stanford, offered as a “massive open online course” (MOOC) and became a highly recommended course for those interested in learning about the field. The course became so popular that it inspired Andrew to cofound Coursera and later DeepLearning.AI. The specialization consists of five courses and is rated 4.9 out of 5.0. The quality is so good that two bachelor programs and three master’s programs will consider it as credit towards their requirements. The courses are:

1. Neural Networks and Deep Learning (24 hours)
2. Improving Deep Neural Networks: Hyperparameter Tuning, Regularization, and Optimization (23 hours)
3. Structuring Machine Learning Projects (6 hours),

4. Convolutional Neural Networks (35 hours)
5. Sequence Models (37 hours)

The specialization is recommended for those who want to understand deep learning from the ground up. The first course works through the mathematics of neural networks including fundamental concepts such as gradient descent, the vectorization of logistic regression, cost functions, activation functions, forward and backward propagation, hyperparameters, and other important concepts. The mathematics include trigonometry, algebra, calculus, and vector and matrix operations. The mathematics of the first course are implemented using Python's NumPy library while courses 2 through 5 implement more complex neural networks and applications using the TensorFlow framework.

Institution: Coursera – DeepLearning.AI

Commitment: 125 hours, with more than half that time doing assignments

What You'll Learn

- Build and train deep neural networks, identify key architecture parameters, implement vectorized neural networks and deep learning to applications
- Train test sets, analyze variance for DL applications, use standard techniques and optimization algorithms, and build neural networks in TensorFlow
- Build a CNN and apply it to detection and recognition tasks, use neural style transfer to generate art, and apply algorithms to image and video data
- Build and train RNNs, work with NLP and Word Embeddings, and use HuggingFace tokenizers and transformer models to perform NER and Question Answering

Data Pipeline Management

[Getting and Cleaning Data](#)

Course Summary: This course focuses on the essential techniques for cleaning and preparing data for analysis. You'll learn about data collection, cleaning, and sharing, with a strong emphasis on using R programming for these tasks.

Institution: Coursera – Johns Hopkins University

Commitment: 19 hours, with more than half that time doing assignments

What You'll Learn

- Understand common data storage systems
- Use R for text and date manipulation
- Apply data cleaning basics to make data “tidy”
- Obtain usable data from the web, APIs, and databases

Comments from TFHRC/Volpe Course Reviewers

- Electronics Engineer, Volpe - The course materials were well-rounded and comprehensive. I expect that TFHRC staff would be able to apply the knowledge or skills from this course in their

workflows. The course provided useful job aids, tip sheets, or other tools to assist learning. I would recommend this course to R&D staff at TFHRC. Main focus is on databases and data file types including: csv,.xlsx, databases (mySQL), APIs, XML, and JSON.

Ethics

Ethics in AI and Data Science

Course Summary: In this course you will learn how to build and incorporate ethical principles and frameworks in your AI and Data Science technology and business initiatives to add transparency, build trust, drive adoption, and lead with trust and responsibility.

Institution: edX – LinuxFoundationX

Commitment: 6-12 hours

What you'll learn:

- Discuss the ethical challenges of AI and Data Science.
- Understand the impacts of AI and Data Science.
- Explore both the business and societal dynamics at work in an AI world.
- Understand how to begin setting up a framework for AI Principles.
- Discuss practical strategy and challenges of building an AI framework.
- Learn the tools to put ethics and responsibility into practice at your organization or company.

Content Outline

- Chapter 1. The State of Ethics, Trust & Responsibility with AI and Data Science
 - What's at Stake & Why It Matters
 - Ethics & Responsibility
- Chapter 2. What Do We Mean by Artificial Intelligence (AI) and Data Science and Why It Matters
 - What is AI?
 - What is Data & Data Science?
 - The Complex World of Data
- Chapter 3. Strategies (& Challenges) of Putting Ethics & Responsibility into Practice
 - Putting Ethics into Practice
 - Let's Practice!
 - Toolkits, Software & Tools for Bias & Impact Assessment
 - Ten Practical Strategies to Avoid Common Pitfalls With Responsible Frameworks

Generative AI

Generative AI: Fundamentals, Applications, and Challenges

Course Summary: In this course, you'll discuss the potential benefits, uses, and challenges of a variety of applications for generative AI. Explore the impact these tools could have on business, operations, consumers, society, and the environment. Aspects of the course also dive into the general risks associated with this technology, including issues such as copyright infringement, outdated data,

malicious attack surfaces, bias, and more. By participating in this course, you'll gain a strong baseline of knowledge for generative AI, one that will allow you to explore further considerations about its impact on businesses and society.

Institution: Coursera – University of Michigan

Commitment: 2 hours

What You'll Learn

- Understand the basics of generative AI
- Discuss the application of generative AI
- Describe the general risks associated with generative AI systems

Course Outline

- Introduction to the Course
 - Introduction to Responsible Generative AI
 - What is Responsible and Trustworthy Generative AI?
 - Basics of Generative AI
 - Predictive vs. Generative AI
 - Lifecycle of Generative AI
 - Data Training
 - Fine Tuning
 - System vs. User Prompts
- Use Cases of Generative AI
- Responsible Generative AI Concepts
 - Inaccuracies in Outputs
 - Data Protection
 - Bias & Stereotyping
 - Copyright Infringement
 - Malicious Attack Surfaces
 - Outdated Training Data

Comments from TFHRC/Volpe Course Reviewers

- Research Engineer, TFHRC– I think content is good for someone who would like to understand the fundamentals of GenAI including model development, use cases and potential risks and limitations. The course is well-structured and sequenced.
- Research Safety Specialist, TFHRC - This is a good introduction to generative AI. It discusses tokens/ vectors/ transformers at a basic level.

Trustworthy Generative AI

Course Summary: This course teaches techniques for determining if a problem fits Generative AI's capabilities, framing problems to reduce risk, prompt engineering for trust, and appropriate human engagement in the process. Students learn concrete prompt designs, how to check outputs, how to use Generative AI for ideation and creation, ways to augment human skills, and more ethical, beneficial applications.

Institution: Coursera – Vanderbilt University

Commitment: 8 hours

What you'll learn

- Leverage prompt engineering techniques to generate more reliable outputs
- Master methods to verify and validate outputs
- Frame problems in alternative ways to reduce risk
- Apply generative AI for creative ideation
- Use Generative AI in ways that augment rather than replace human reasoning and creativity

Course Outline

- Generative AI is Not a Source of Facts•6 minutes
- Make Sure Checking if the Answer is Correct is Easy•5 minutes
- Avoid Hard to Check Answers•3 minutes
- Look for Problems Where Partial Answers Provide Value•7 minutes
- Think About Risk•6 minutes
- Does the Use Benefit You as a Human?•7 minutes
- ACHIEVE•19 minutes
- Filtering•10 minutes
- Ideation•5 minutes
- Navigation•7 minutes
- Expertise•12 minutes

Comments from TFHRC/Volpe Course Reviewers

- Team Leader, TFHRC – I thought the topics included in the content were useful and practical. I thought the material was presented in a straightforward and accessible way. I thought the name of this course, "Trustworthy Generative AI" didn't accurately describe the content of the course. The instructor spent a lot of time talking about the most appropriate uses of generative AI that would in turn make it more trustworthy. Maybe a better name would be "Effective Use of Generative AI" or something similar.
- Transportation Policy Analyst, Volpe - Gets to the heart of the goal of the DSP >> "how can I ask GenAI the right questions?" Very casual format, reminiscent of a YouTube video essay. Like the GenAI for Everyone, this feels a little pushy ("GenAI is amazing!") and doesn't really cover the "other" side of the argument. Overall, the incremental value of this course is low to moderate. Can probably be replaced by the Prompt Engineering course or one of the GenAI courses.

Prompt Engineering for ChatGPT

Course Summary: This course introduces students to the patterns and approaches for writing effective prompts for large language models. Anyone can take the course and the only required knowledge is basic computer usage skills, such as using a browser and accessing ChatGPT. Students will start with basic prompts and build towards writing sophisticated prompts to solve problems in any domain. By the end of the course, students will have strong prompt engineering skills and be capable of using large language models for a wide range of tasks in their job, business, personal life, and education, such as writing, summarization, game play, planning, simulation, and programming.

Institution: Coursera – Vanderbilt University

Commitment: 16 hours

What you'll learn

- How to apply prompt engineering to effectively work with large language models, like ChatGPT
- How to use prompt patterns to tap into powerful capabilities within large language models
- How to create complex prompt-based applications for your life, business, or education

Course Outline

- Course Introduction
 - Motivating Example: Building a Meal Plan with a Fusion of Food from Ethiopia and Uzbekistan that is Keto•11 minutes
 - Overview of the Course•10 minutes
 - Motivating Example: Act as a Speech Pathologist•7 minutes
 - What are Large Language Models?•10 minutes
 - Randomness in Output•4 minutes
- Introduction to Prompts
 - What is a Prompt?•12 minutes
 - Intuition Behind Prompts•14 minutes
 - Everyone Can Program with Prompts•6 minutes
 - Prompt Patterns•4 minutes
 - The Persona Pattern•13 minutes
 - Introducing New Information to the Large Language Model•7 minutes
 - Prompt Size Limitations•8 minutes
 - Prompts are a Tool for Repeated Use•13 minutes
 - Root Prompts•10 minutes
- Prompt Patterns I
 - Question Refinement Pattern•6 minutes
 - Cognitive Verifier Pattern•9 minutes
 - Audience Persona Pattern•8 minutes
 - Flipped Interaction Pattern•8 minutes
 - Format of the Question Refinement Pattern•10 minutes
 - Format of the Cognitive Verifier Pattern•10 minutes
 - Format of the Audience Persona Pattern•10 minutes
 - Format of the Flipped Interaction Pattern•10 minutes
- Few-Shot Examples
 - Few-shot Examples•6 minutes
 - Few-shot Examples for Actions•6 minutes
 - Few-Shot Examples with Intermediate Steps•9 minutes
 - Writing Effective Few-Shot Examples•10 minutes
 - Chain of Thought Prompting•11 minutes
 - ReAct Prompting•11 minutes
 - Using Large Language Models to Grade Each Other•8 minutes
 - Learn More About Chain of Thought Prompting•10 minutes
 - Learn More About ReAct•10 minutes
- Prompt Patterns II

- Game Play Pattern•16 minutes
- Template Pattern•12 minutes
- Meta Language Creation Pattern•9 minutes
- Recipe Pattern•7 minutes
- Alternative Approaches Pattern•14 minutes
- Format of the Game Play Pattern•10 minutes
- Format of the Template Pattern•10 minutes
- Format of the Meta Language Creation Pattern•10 minutes
- Format of the Recipe Pattern•10 minutes
- Format of the Alternative Approaches Pattern•10 minutes
- Prompt Patterns III
 - Ask for Input Pattern•5 minutes
 - Combining Patterns•4 minutes
 - Outline Expansion Pattern•10 minutes
 - Menu Actions Pattern•8 minutes
 - Fact Check List Pattern•7 minutes
 - Tail Generation Pattern•6 minutes
 - Semantic Filter Pattern•7 minutes
 - Course Conclusion & Thank You•4 minutes
 - Format of the Ask for Input Pattern•10 minutes
 - Format of the Outline Expansion Pattern•10 minutes
 - Format of the Menu Actions Pattern•10 minutes
 - Format of the Fact Check List Pattern•10 minutes
 - Tail Generation Pattern•10 minutes
 - Format of the Semantic Filter Pattern•10 minutes
 - Continue Learning About Prompt Engineering•10 minutes

Comments from Volpe Course Reviewer

- Operations Research Analyst, Volpe –The curriculum covers topics I would like to study more deeply and have my team members know: multiple alternative structures/approaches for using generative AI chatbots to address different sorts of problems. As others have noted for this Vanderbilt U. professor, the videos are accessible and engaging, as you’d expect from a good series of YouTube videos or a direct-from-university course.

Appendix E. Course Assessment Tool

This assessment tool is intended for Turner-Fairbank staff after completing each course or curriculum from the *Course Catalog for Data Science 101*. As you complete this course assessment, consider how this course or curriculum may or may not help you meet your core responsibilities and complete your core tasks.

Please enter the name of the course you are assessing: Name of Course or Curriculum

Content	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. The contents of this course were too advanced	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I was already familiar with the materials prior to taking the course	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. The course focused too much on specific tools that may not be available to my organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. The course materials were well-rounded and comprehensive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I will be able to apply the knowledge or skills from this course in my workflow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presentation	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
6. The estimated commitment level in the course description was accurate	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. The course fully captured my interest and attention	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. The course provided useful job aids, tip sheets, or other tools to assist my learning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Overall Assessment	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
9. I was able to download the course materials and will be able to access or refer back to them in the future	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I would recommend this course to other colleagues in my role at Turner-Fairbank Highway Research Center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. I would recommend this course to my colleagues in other roles at Turner-Fairbank Highway Research Center	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I feel energized and excited to learn more about this topic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Any other comments on course content?

Any other comments on course presentation?

Any other comments on overall assessment?

What comments do you have on this form?

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DOT-VNTSC-FHWA-25-07
FHWA-HRT-25-102



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