Machine Learning Engineering Career Track

Syllabus & Course Overview


Springboard

Introduction

The mainstream adoption of AI-powered products coupled with ever-bigger bets by tech and tech-adjacent companies has led to an AI talent shortage that many experts predict won't be alleviated for years. Consider this:

The global machine learning (ML) market is estimated to grow from $1.4 billion in 2017 to $8.8 billion by 2022. (Source Research and Markets)
AI is projected to create 2.3 million jobs by 2020. (Source: Gartner)
From 2015 to 2018, the number of AI-related job postings on Indeed increased by 119 percent. (Source: Indeed)
Machine learning is the most in-demand AI skill. (Source: Indeed)

All of that is driving pay sky high. Machine learning engineers earn an average salary between $125,000 and $175,000. Salaries at the 10 highest-paying companies for AI engineers start above $200,000 a year.

At Springboard, we're focused on filling the gaps in the current job market and helping people around the world achieve their career goals through accessible, flexible, lifelong learning. The AI / Machine Learning Career Track is an intensive bootcamp that will equip you to transition into a role as a machine learning engineer.

What makes this course unique? This **is the first Machine Learning Engineering bootcamp with a job guarantee**. With support from our career services team, you will find a job within six months of completing the course. But if you don't, we'll refund your tuition. (We've helped hundreds of Data Science Career Track students find jobs and have yet to issue a refund.)

And while graduate programs and other online courses focus on MLE concepts, we want you to apply what you're learning. Yes, our curriculum is rigorous and deeply technical, teaching you the foundations of machine learning and deep learning. But it's also hands-on.

We don't just teach you ML, we let you do ML.

Of the 500 hours of work we estimate it will take to complete this course, 100 hours go toward projects. You'll build and deploy large-scale AI systems — with guidance from your

personal mentor, an experienced machine learning engineer currently working in the industry.

Who's It For?

The Machine Learning Engineering Career Track is an advanced course for people who have strong software engineering skills and industry experience and who want to become machine learning engineers

How It Works

- **Cost and Schedule:** The course costs $1490 per month. It is fully online and features a flexible pace so that you can study anytime, anywhere, even if you have a full-time job. Students can complete the course in 6 months if they dedicate 15 to 20 hours of work per week. You're welcomed to complete in less or more time — you pay only for the months you're enrolled.
- **Enrollment:** We have monthly cohorts — enrollment opens a few weeks before each class is set to begin. If enrollments aren't open, you can sign up for the waitlist on the course page.
- **Mentor-matching process:** Once you enroll, you'll be asked to fill out a profile, which includes questions about your background, your availability during the week, and the skills you want to develop. Your student advisor will use this information to match you with a mentor who suits your specific needs.
- **A curriculum curated by experts:** We believe that diverse perspectives lead to better learning outcomes. Our online curriculum is packed with quality AI and machine learning resources, some of which are handpicked from around the web by industry experts and others that are created by Springboard. Our instructional designers then build these resources into a curriculum that includes projects and quizzes.
- **A Springboard support team** that includes a student advisor, mentor, community manager, and career coach.
    - Your **student advisor** will match you with a mentor, help you prepare for the course, and answer your general questions.
    - You'll have **1-on-1 calls with your mentor** each week. They'll provide feedback on projects, answer questions about the curriculum, and give you career advice and industry insight.

    - Your **community manager** can answer questions about the curriculum and machine learning engineering industry.
    - Your **career coach** will help you during your job hunt and can give you tips about how to network, create a strong machine learning engineer resume, and more.
    - The **Springboard community**: While online learning may sound isolating, it's important to remember that you have a whole community learning alongside you. You'll get access to this community so you can share triumphs and trials, get feedback, and attend weekly live Office Hours.
- **Career services:** In addition to learning about machine learning, you'll also work through sections of the curriculum that cover career material that will guide you through your job search.
- **Certification:** Once you finish the course material and submit your capstone project, you'll get a certificate of completion.
- **Job guarantee:** We guarantee that you'll have a job offer within 6 months of graduating, or you will get 100% of your tuition refunded. Eligibility criteria and terms here.

Syllabus

In this 500-hour course, you'll learn foundations of machine learning and deep learning — and how to implement them at scale. The first half of the course focuses on building and scaling a working prototype (either in ML or DL,) while the second half focuses on deploying your prototype to production.

Modules Include:

1) The Machine Learning Engineering Stack

Throughout this course, you'll be introduced to a variety of tools and libraries that are used in the data science and machine learning world. These include everything from ML libraries to deployment tools. There will also be refreshers on software engineering best practices and foundational math concepts that every ML Engineer should know.

Topics Covered:

1. The Python Data Science Stack: Pandas, scikit-learn, Keras, TensorFlow
2. Data engineering tools: Spark/PySpark, Luigi, Containers, AWS

3. Software engineering tools: Continuous integration, version control with Git, logging, testing, and debugging
4. Data structures and algorithms refresher and optimizing Python to write faster code

2) Data Wrangling

No matter what kind of data you're working with, collecting, cleaning up and managing that data will be a critical part of your work. In this unit, you'll learn to collect data at scale from APIs, real-time systems, and websites. You'll also learn to transform this data efficiently and effectively for ML algorithms to crunch down the pipeline.

Topics Covered:

1. Collecting data: APIs, real-time systems, web scraping
2. Cleaning and transforming data for AI systems at scale
3. Working with large data sets in SQL and NoSQL databases
4. Tools such as Pandas, Spark, Dask, SQL, Spark SQL

3) Math and Stats

In this unit, you'll learn about the fundamental mathematical and statistical concepts that make up the core of the field of machine learning, including calculus and linear algebra. You'll also work through subunits devoted to statistical concepts like basic probability concepts such as conditional probability, independence and Bayes theorem. You'll also learn about Bayesian Statistics and inference, which is a new set of techniques used to quickly assess risk in systems in a highly interpretable manner. This slew of techniques is often called "Probabilistic Programming."

Topics Covered:

1. Mathematical concepts like calculus and linear algebra
2. Stats concepts like conditional probability, independence, and Bayes Theorem
3. Probabilistic programming

4) Foundations of Machine Learning

Machine Learning combines aspects of computer science and statistics to extract useful insights and predictions from data. In this unit, we'll cover the most important machine learning algorithms (supervised and unsupervised). You'll learn when these

algorithms are useful, the assumptions they incorporate, the tradeoffs they involve and the various
metrics you can use to evaluate how well your algorithm performs. Most importantly, you'll learn to implement them at scale.

Topics Covered:

1. Common algorithms like linear regression, logistic regression, and statistical modeling
2. Advanced algorithms like Decision Tree, Random Forest, gradient boosting, and K-means clustering
3. Model selection, evaluation, and interpretation concepts like regularization, the Curse of Dimensionality, and cross-validation
4. Supervised and unsupervised learning
5. Tools: scikit-learn, SparkML, Auto-ML systems

5) Machine Learning at Scale

Machine learning is one thing, but machine learning at scale is an entirely different beast. Deploying machine learning models at scale is one of the most important tasks an ML engineer works on, especially as our world and our data get more complex. This means creating software that can be used by people around the world.

Topics Covered:

1. Advanced data wrangling skills like optimizing pandas code and working with advanced SQL
2. Using Dask to scale large datasets
3. Using SparkML to scale an ML model, debugging and monitoring Spark ML applications and pipelines

6) A Deep Dive into Deep Learning

Deep learning is a set of advanced machine learning techniques that power many of today's most cutting edge applications, including image recognition, machine translation, self-driving cars, speech recognition, and more. It is based on neural networks, which are loosely inspired by the structure of the human brain. In this unit, you'll establish a thorough foundation in deep learning and build real-world applications.

Topics Covered:

1. Overview of Neural Networks, Backpropagation and foundational techniques
2. Principles of Deep Neural Networks
3. Common Deep Neural Network configurations e.g. RNNs, CNNs, MLPs, LSTMs
4. Generative Deep Learning and GANs
5. Engineering Frameworks: Keras, TensorFlow, PyTorch

7) Natural Language Processing

NLP uses techniques from computer science, linguistics, and machine learning to process human language, typically in the form of unstructured text. In this unit, you'll learn the basics of text data, how to clean and process it, and how to extract insights from text sources and conversations. We'll walk you through a detailed case study to solve a real NLP problem using Deep Learning and other techniques.

Topics Covered:

1. How to work with text and natural language data
2. NLP in Python, using common libraries such as NLTK and spaCy
3. Representing language: BOW, TF-IDF, word embedding models (word2vec, GloVe, FastText, and StarSpace)
4. Deep Learning techniques for NLP
5. Chatbots and other modern NLP applications

8) AI Tutorial: Computer Vision [30 hours]

Image processing has taken off in the last decade due to the proliferation of images on social media sites such as Facebook and Instagram. Recognizing objects such as cars, and individuals from images is a hard problem, but AI techniques have made huge strides. In this case study, we'll go through image processing techniques and solve a real image processing problem. Computer vision and image processing concepts will be spread across two units — one that dives into the theory behind these concepts and another that works through a hands-on tutorial that will help you put into practice everything you've learned.

Topics Covered:

1. Foundations of computer vision and image processing
2. Image clustering and classification with K-means, multitask classifiers, and GANs
3. Object detection and image segmentation with algorithms

4. Applications and trends in computer vision

9) Deploying AI Systems to Production

This is the unit where the rubber meets the road. You'll take everything you have learned so far: the tools, techniques, and the libraries and deploy a large-scale AI system.

Topics Covered:

1. Common tools and techniques to build large-scale AI applications
2. Tools for building quality APIs
3. Productionizing models with CI and CD
4. Tools like PySpark, PyTorch, and Spark for model production

10) Capstone Project

The Capstone Project is a mandatory part of our curriculum. This course has one capstone project that has been split up into two phases. Using a combination of tools and techniques that you've learned, you'll build a realistic, complete, ML or DL application that's available to use via an API, a web service or, optionally, a website.

Work on your capstone project will involve:

Phase One: Building a working prototype

1. **Step One**: Pick your initial project ideas.
2. **Step Two:** Write your project proposal.
3. **Step Three:** Collect your data.
4. **Step Four:** Data wrangling and exploration.
5. **Step Five:** Create a machine learning or deep learning prototype.
6. **Step Six:** Scale your prototype.

Phase Two: Deploy your prototype to production.

1. **Step One:** Create a deployment architecture.
2. **Step Two:** Run your code end-to-end with testing.
3. **Step Three:** Deploy your application to production.
4. **Extra Credit Step**: Build a web interface to your application

Springboard will provide you free access to a cloud-based engineering environment, which will support all of the standard tools and libraries.

11) Career Support

Our highly experienced career coaches will help you find your dream MLE job. We'll help with creating a highly effective resume showcasing your transferable skills from your previous roles, as well as your new MLE skills and projects. You'll receive feedback via mock interviews, both technical as well as behavioral, to prepare for the interview process. We'll show you how to effectively get and ace interviews, and negotiate an above-market salary.

Topics Covered:

1. Job search strategies that top candidates use
2. How to build your network and effectively use it to land interviews
3. Create a high-quality resume, LinkedIn profile and cover letter
4. Interview coaching and practice, including mock interviews for both technical and non-technical topics
5. Negotiation success tips

Ready for the next step?

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Questions about Springboard?

Email us at **hello@springboard.com** with any questions.