Syllabus

Holberton

2019

Table of contents

1. Why Holberton?

"There's going to be **1.4m** Tech Jobs in the next decade & only **400k** trained people to fill them."

Courtesy: The New York Times

Holberton is not your typical school.

You won't see **any teachers here**, it's true. Here, **we learn best by collaborating.** Here, every student becomes a mentor, because the surest way to cross the finish line is **by supporting one another**.

We encourage our students to always ask why and challenge the standards of the status quo. By challenging ourselves and each other, **we're building a new kind of community.** Because **diversity brings resilience**, we welcome many different points of view. The only thing we won't tolerate here is intolerance.

At Holberton, we aren't just learning how to code. We're learning how to learn — together.

We're going to rewrite the rules — **for the better.**

What sets Holberton students apart

Full-stack engineers

Our curriculum covers low-level programming , algorithms, high-level programming, and systems engineering.
Our students have a solid software engineering foundation — knowing more than one programming language.

Master of soft skills

Students will not only learn technical skills but build up their soft skills through presentations, technical writing, and group projects, making them a valuable asset to any team.

Adaptable

Our students learn how to learn; therefore they are able to pick up new skills and tools very quickly within any type of environment.

Diverse

Our students come from a variety of backgrounds and experiences, bringing a unique perspective to any work environment.

Top companies hired our students

Our students have landed software engineering jobs and internships across all industries and company sizes. See some of the employers who have hired our students.

Success

Early career pay by school for computer science majors or equivalent

* **$109,000 / yr** Current median full-time salary of Year 2 graduates working in the US (SF Campus - December 2019 -

Read more

Our Campuses

Holberton

Innovation has an address

United States

San Francisco, CA

Established in 2016 and located in the heart of Silicon Valley, our SF campus is near Market St, home of Big Tech headquarters.

New Haven, CT

Located in Connecticut's tech hotspot, New Haven hosts both innovative startups and multinational conglomerates.

Tulsa, OK

Tulsa, Oklahoma has a diverse economy and offers employment opportunities in finance, aeronautics, telecommunications & technology.

Colombia

Bogotá, Colombia

Located Bogotá's prestigious "gourmet" district, Zona G, the city is the home of the first "unicorn" of the country, Rappi.

Medellín, Colombia

Medellín is the hub for all remote Tech workers who wants to join US companies without leaving Colombia.

Cali, Colombia

Located in the Zonamerica, our campus has the latest technologies.

Barranquilla, Colombia

On the tech front, Barranquilla is home to software development companies like Koombea, IdeaWare, and FullStack Labs.

Tunisia

Tunis, Tunisia

Located in the heart of the capital of Tunisia, our campus is equipped with the latest technologies.

Lebanon

Beirute, Lebanon

Located at Beirut Digital District, which offers a superior business environment for fostering the growth of digital startups.

Admissions

Holberton

Where there's a will, There's a way

Our selection process is based on talent and motivation. We don't care what degrees you may or may not have, if you have any previous programming experience, or your ability to pay. If you possess the curiosity, determination, and drive to succeed, then we want you as a Holberton student.

Our automated admissions process is completely “blind” to remove human biases. It was created specifically to identify smart, motivated people and doesn’t take into account previous education, work experience, gender, ethnicity, or age. There’s also no cost to apply - we only ask you to have a GED or high school diploma.

Here's how it works:

- Fill out a short online form about yourself (about 2 minutes)
- Complete small online projects and tests that you can do at your own pace (about 2 hours)
- You'll create your first website, from configuring a server to writing HTML, CSS and JavaScript (about 2 weeks)
- Complete an on-site or remote Q&A and tech challenge.

Apply now

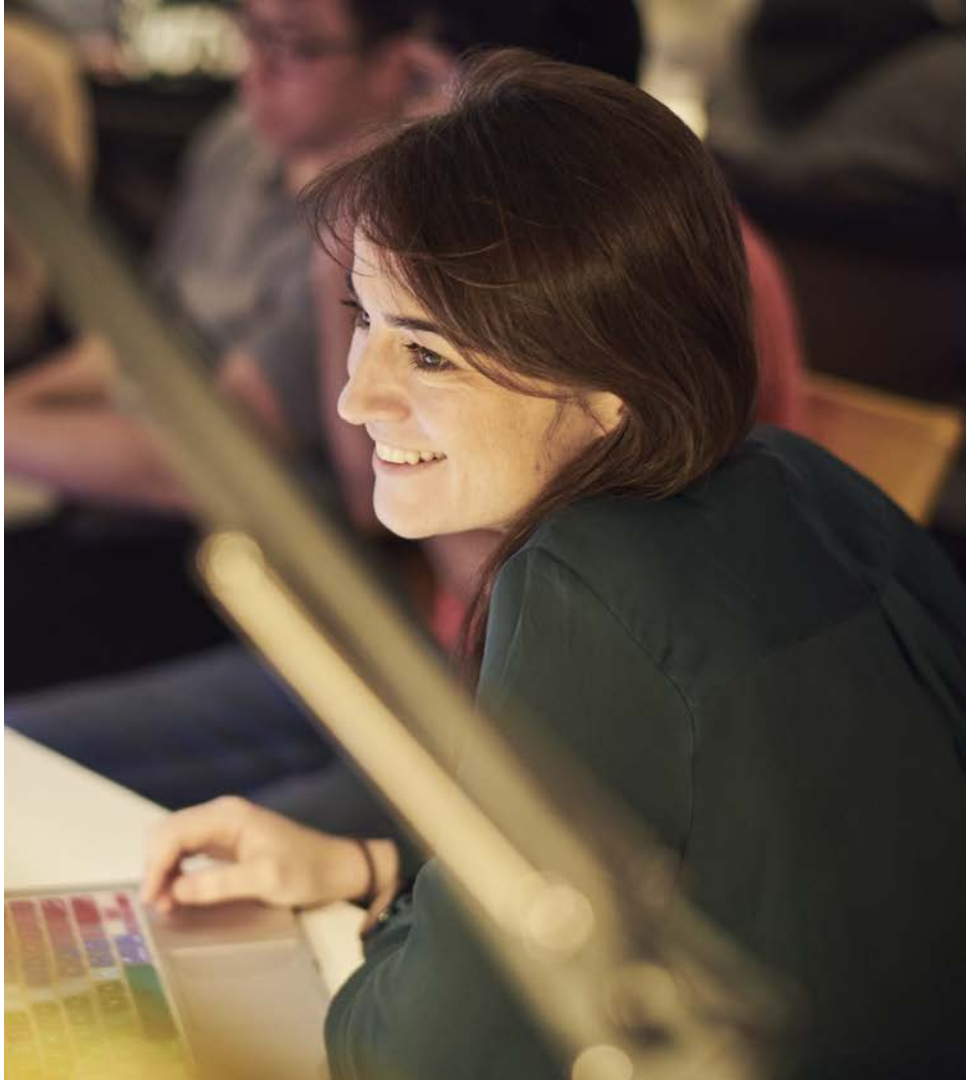
2. The Holberton way

No pre-course

Holberton does not expect students to come in with previous software engineering experience (although if you do have experience, that's awesome too).

There is no **pre-course work** (that's why you are attending a school after all), but we do recommend that you read through The C Programming Language book by Kernighan and Ritchie or Programming in C by Stephen Kochan.

The goal of reading through the book is not to deeply understand all the concepts, but to familiarize yourself with key terminology and content.



Coursework

We are training you to be a full-stack software engineers in 24 months. The program will be intense.

There are no formal teachers or formal lectures. Students are learning by creating and we rely on peer-learning, collaboration, and industry-relevant curriculum to guide the way.

There is no competition here at Holberton, rather students are helping each other towards their goals. Of course, there is also technical staff available to answer questions and extend support, as well as mentors who share their expertise along the way.

Soft skills

In today's tech world, it's not enough to be good at technical skills, you need to be a clear communicator as well.

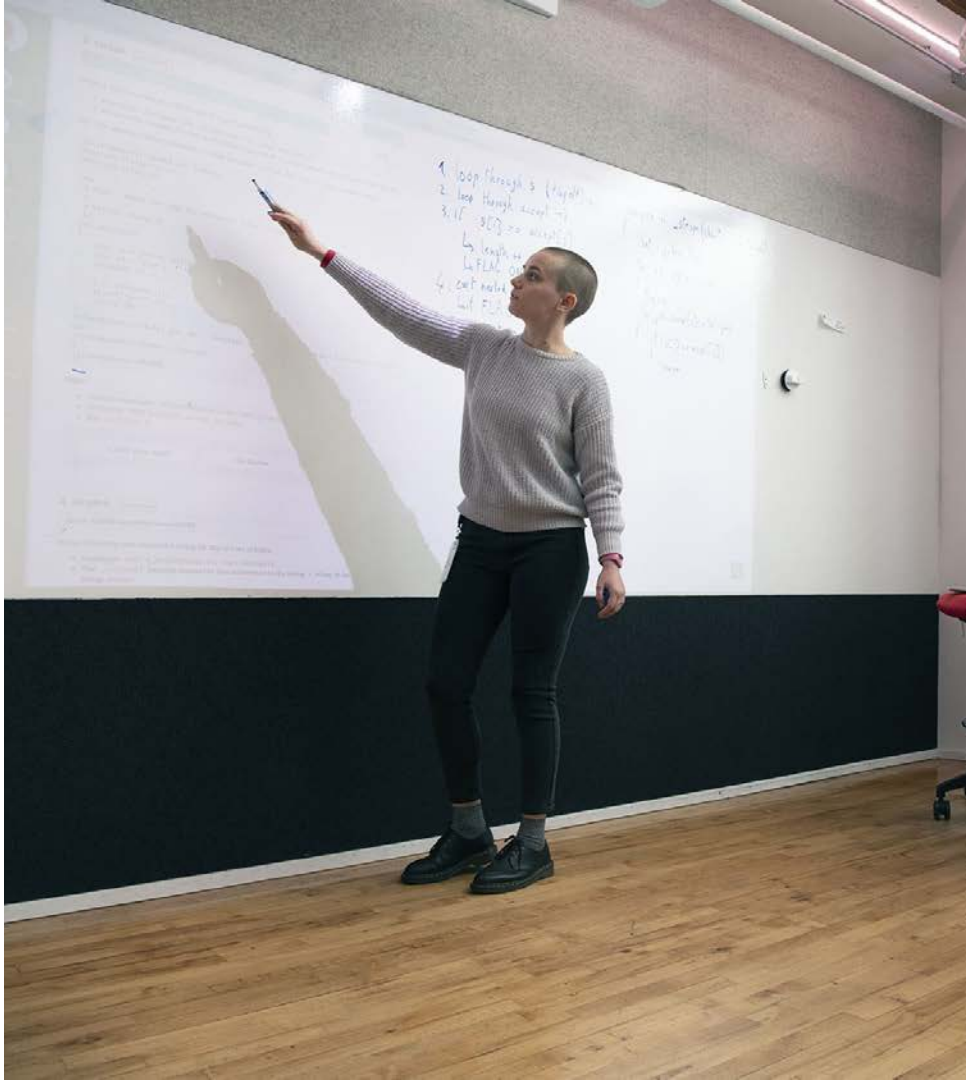
We push our students to work on their public speaking skills, to publish blog posts to online tech communities and publications, and to speak at conferences and meetups.

This not only prepares students to be team players and clear communicators, but creates amazing networking opportunities.

Professional development

We know that the skills to get a job are different from the skills to be good at a job. From week zero, we immerse students in professional growth and development via workshops, projects, meetups, and work simulations.

Whiteboarding, mock interviews, professional networking, and more begin as soon as students start the program so that they're confident and competent when the time comes to prove they're ready for the job.

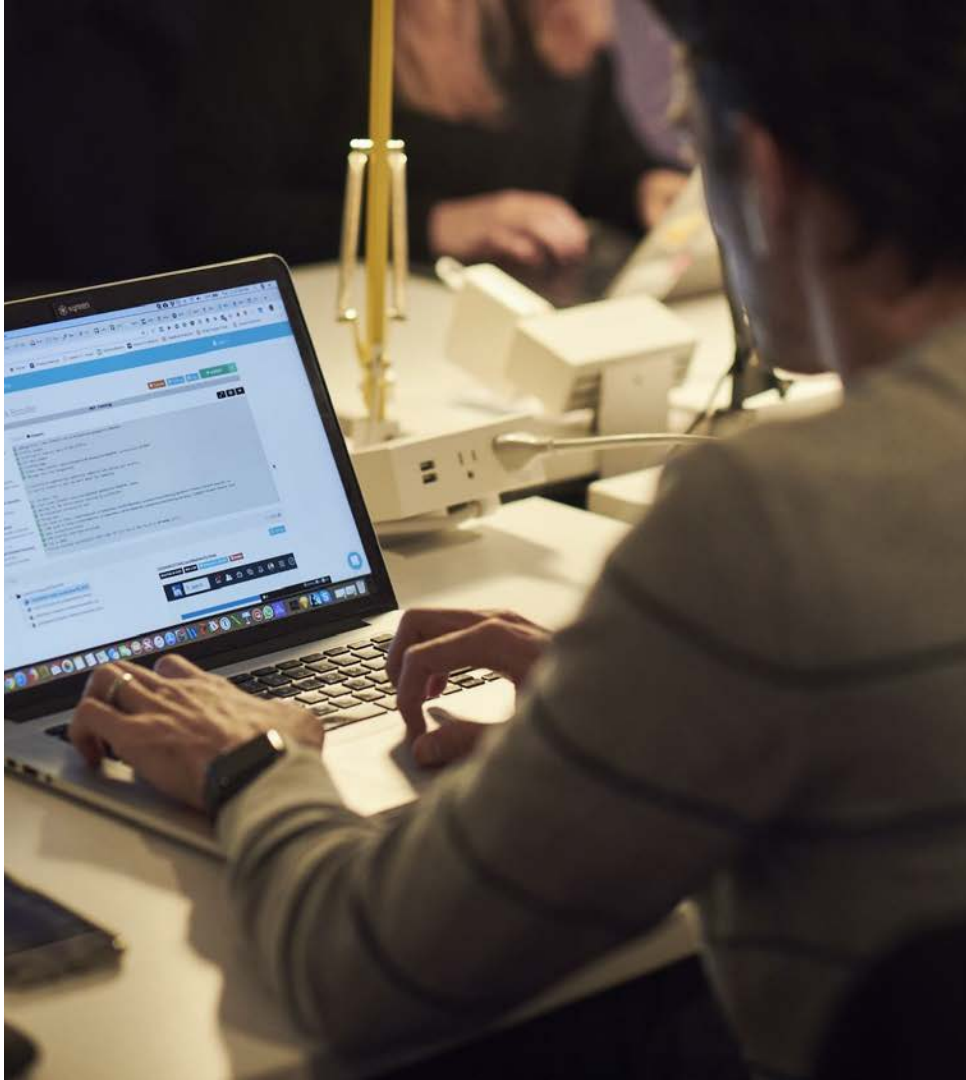


Job search

Utilizing our networks and creating networks of your own will provide you with the best opportunities to find a job as a Software Engineer — to know someone on the inside who can get your resume in front of the right people and give you a personal recommendation.

We are not just concerned about you finding your first job in tech, though; we want to equip you with the knowledge and resources to drive your job search so that you are independently successful in the years to come — regardless of how your interests or the industry evolves.

You'll learn how to build your narrative, demonstrate your technical skills, negotiate, and navigate the industry with confidence.



Professional advisors

Our professional advisors are the backbone of Holberton.

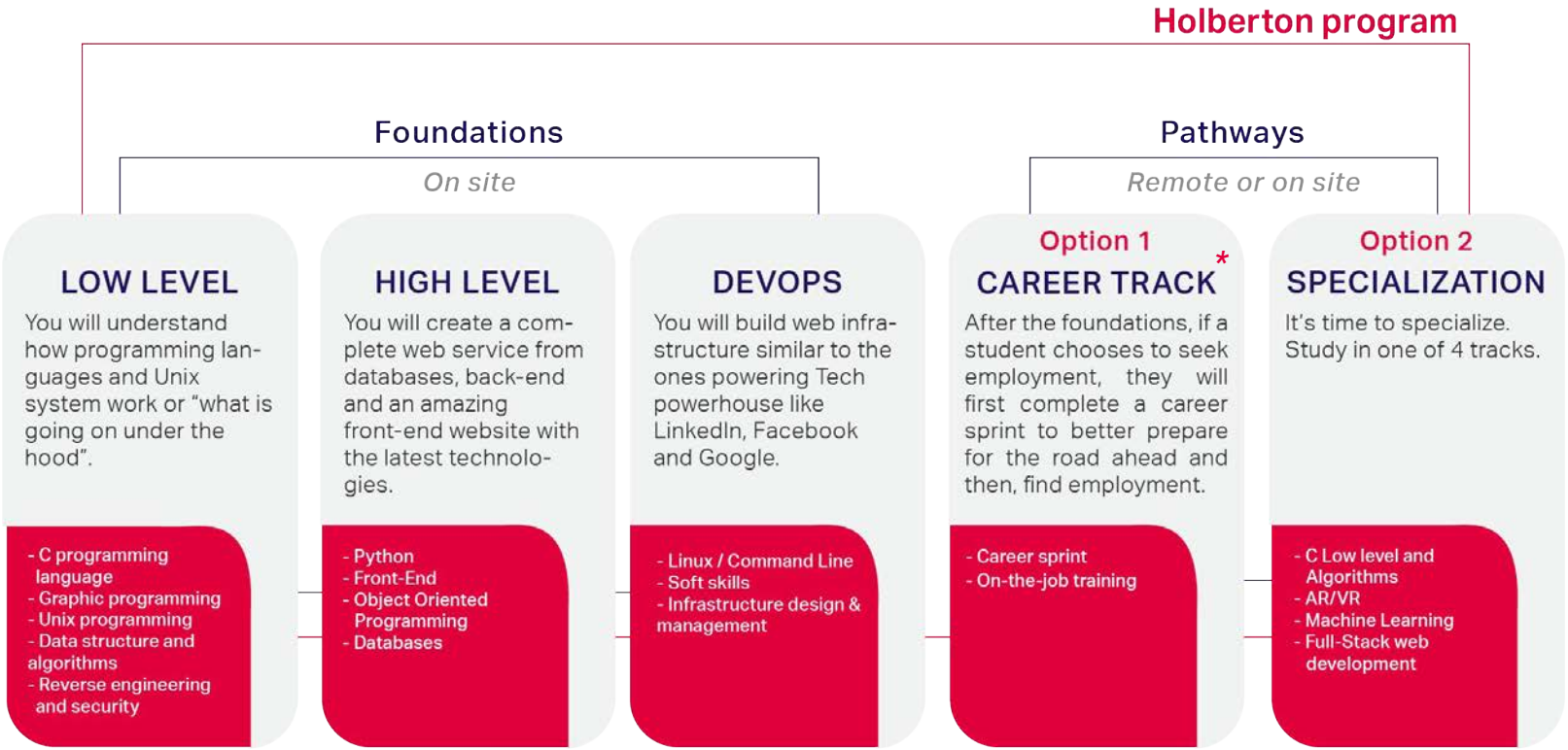
They provide feedback about our curriculum, are resources for our students, and are an endless source of knowledge about the most current technologies and frameworks.

They help keep the school in check to make sure we are delivering the most relevant content to each new cohort of students. They provide mentorship, deliver workshops, and collaborate on projects given to students.

This partnership with mentors across all spectrums of the tech industry creates paramount and unprecedented exposure for our students.

3. Pathways

How our program works



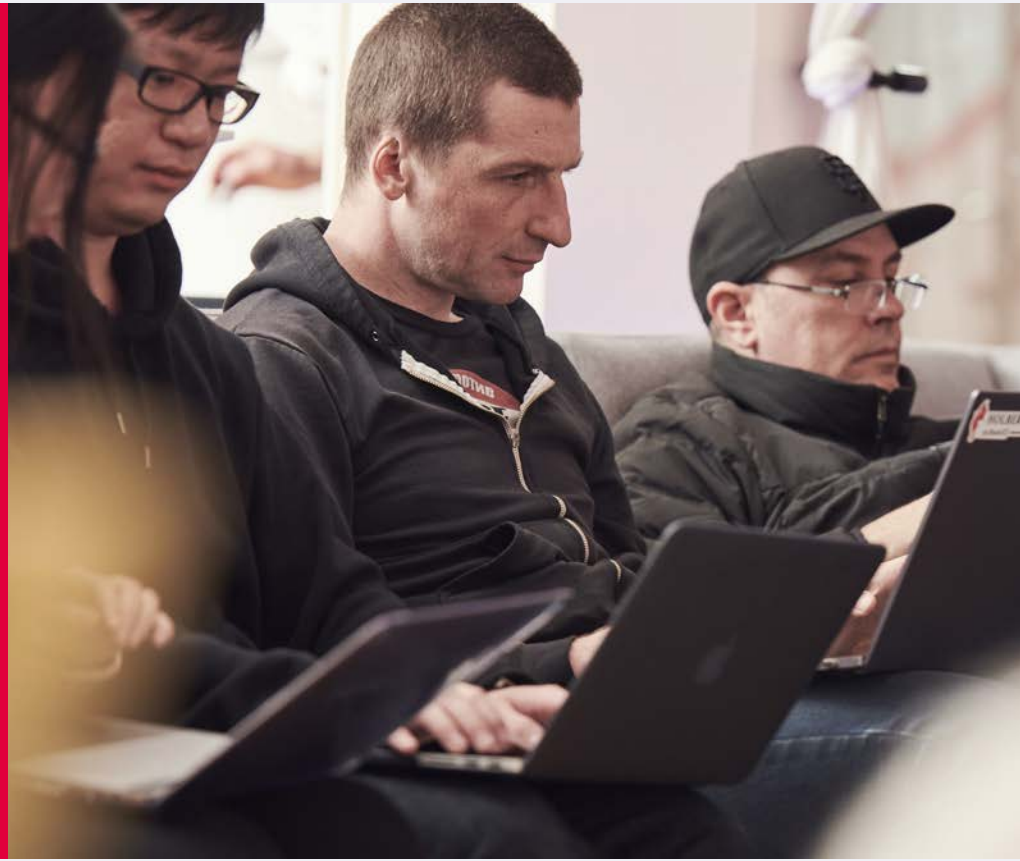
**This option is not available in the San Francisco location due to CA regulation.*

Pathways: foundations & specializations

This syllabus is an overview of the topics, languages, and frameworks you will learn during your 18 months at Holberton. It is not a definitive outline and is subject to change to fit the needs of the ever-changing tech industry.

Our program walks through the major arms of computer science and software engineering — data structures, algorithms, low-level and high-level programming, Linux and UNIX system programming, web front-end and back-end, databases, security, system administration, and devops.

Additionally, you will develop professional skills such as public speaking, networking, project management, and effective communication.



3a. Foundations

Holberton teaches full-stack software engineering with a project-based approach.
The first part of our on-site intensive education covers the foundations of software engineering, including low-level programming, DevOps, and high-level modern languages.

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Low level

You will understand how programming languages and Unix systems work, “what is going on under the hood”. This will allow you to optimize and debug anything later in your career. You will be working with algorithms and data structures which are essential foundations for any great Software Engineer, the type that the best companies want to hire.

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Low Level

C programming language

-Compilation
-Commenting code and following a coding style standard
-Variables, types, operators, expressions
-Loops, nested loops
-Conditional statements
-Functions
-Preprocessor, macros, header files
-Pointers, pointers to pointers, pointers to functions, pointer arithmetic
-Arrays, multidimensional arrays
-Structures
-Static and dynamic libraries
-Program arguments
-Dynamic allocation
-Virtual Memory, heap and stack
-Binary operations
-Makefiles

Graphic programming

-SDL2
-Isometric projection Raycasting

Unix programming

-Unix / Linux overview
-File I/O, Memory allocation process creation and termination System calls

Data structure and algorithms

-Time and space complexity
-Arrays, structures
-Linked lists, doubly linked lists, circular linked lists (you are gonna love linked lists)
-Stacks and queues
-Hash tables
-Recursion
-Search & sorting algorithms
-Binary trees, BST, AVL

Reverse engineering and security

-Introduction to assembly basics
-Disassembling
-Buffer-overflow
-Executable code injection
-Tools: strings, ltrace, objdump, radare2, radiff2, ldd

Examples of low level projects

-Create your own printf function
-Code from scratch a mini-shell
-Your own Maze (mini game)

Linux

High level

You will create a complete web service with databases, back-end, and an amazing front-end website with the latest technologies. This project will give you all the skills to work in the best companies in Silicon Valley such as Facebook or Dropbox. You will gain the skills to quickly learn and adapt to new frameworks for building products or to iterate on an existing codebase.

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High Level

Python

-Interpretation
-Commenting code
-Following a coding style standard
-Variables, types, operators, expressions, loops, iterators
-Conditional statements (if, else, while)
-Functions
-Libraries
-Data structures
-Exception management
-Class, metaclass, decorator
-Network requests
-Application programming interface scripting

Front-End

-HTML/CSS
-Accessibility
-Javascript

Object-oriented programming

-Object notation
-Public - internal interfaces
-Inheritance
-Data formatting (JSON/XML...)
-Serialization and deserialization

Databases

-SQL language
-Relational database
-Data definition language
-Data manipulation language
-Data control language
-MySQL - SQLite
-Object-relational mapping

Examples of projects

-Create your own AirBnB website complete with database, front-end, back-end, console, and testing
-Hack a website's security by scripting requests

Sysadmin / Devops

You will build web infrastructure similar to those powering tech powerhouses like LinkedIn, Facebook, and Google. You will architect scalable, reliable, and secure systems using web servers, load balancers, databases, firewalls, and more. You will learn to automate your job so that you can easily manage anything from one server or hundreds of them.

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Sysadmin / Devops

Linux / Command line

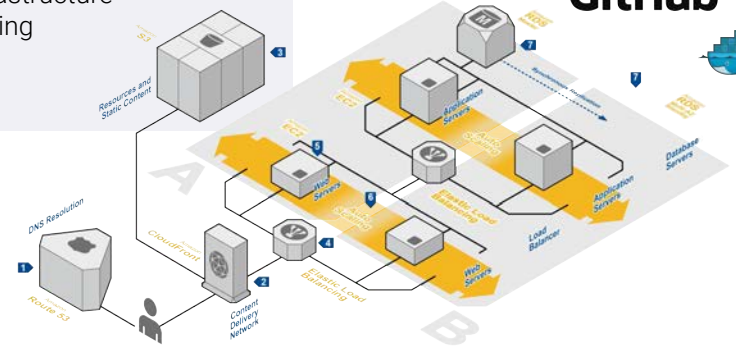
-How the Shell works
-Navigating the file system
-Manipulating files
-I/O redirections, standard input, standard output, pipes, filters
-Permissions
-Job control
-Shell scripts

Soft skills

-Organizing meetups
-Fireside chat sessions
-Attend meetups and conferences
-Technical articles
-Public speaking
-Mastering social media
-Networking
-Project management
-Conflict resolution

Infrastructure design & management

-Parsing
-Advanced log parsing
-Advanced SSH
-Set up a domain name
-Understanding DNS
-Set up SSL certificate
-Manage web servers
-Manage load balancers
-MySQL Primary/Replica setup
-Firewall management
-Web infrastructure design
-Monitor a web infrastructure
-Web stack debugging



Examples of projects

-Build a web infrastructure like the ones powering Facebook, LinkedIn, Twitter, etc.
-Learn to work at scale
-Develop tools for Cloud environments

gandi.net amazon web services OVH.com

GitHub python docker

3b. Specializations or career track*

After you acquire the foundations of software engineering, you specialize.
Students have the opportunity to go beyond the foundations with specializations that focus on exciting emerging technologies. After acquiring the foundations, you will be able to **choose from our specializations: Machine learning, AR/VR, Low Level and Algorithms** , **Full-Stack Web Development** or **Career Track**.

This option is not available in the San Francisco location due to CA regulation

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Project-Based Peer Learning

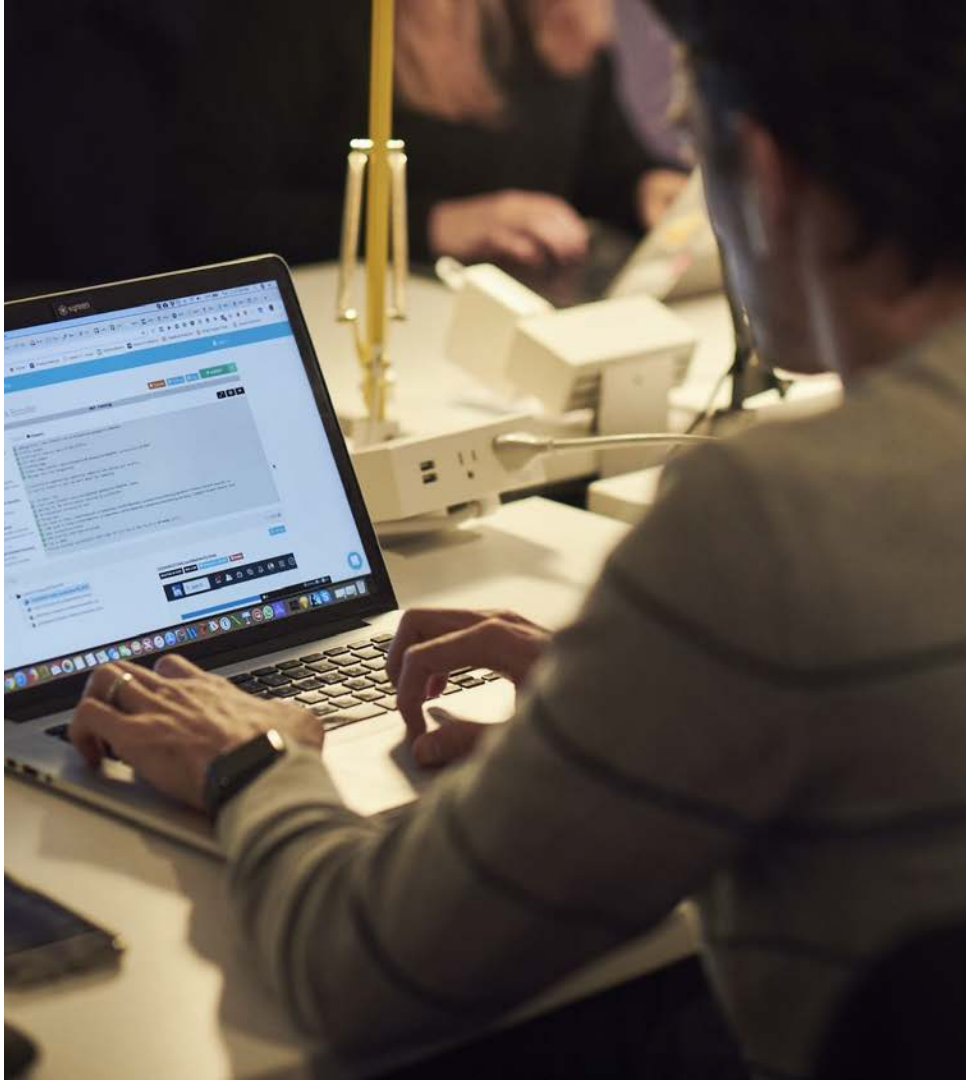
Continuing with the format that has allowed Foundations to powerfully develop technical and soft skills, Specializations leverage onsite interactions as well as global peer collaboration for accelerated growth.

- **Still no teachers or formal lectures**
- **Students are learning by creating with peers**
- **Opportunity for Cross-Campus Collaborations**
- **Monthly Streamed Topic Deep Dives from Content Creators and Industry Experts**

Career Preparation

In the last trimester of Specializing, you'll complete our Career Preparation curriculum so you're ready to start an effective and relevant job search upon graduation.

- **Portfolio-focused projects**
- **Weekly interview algorithm project**
- **Integrated Career Sprint Curriculum**
    - *Portfolio Development*
    - *Networking*
    - *Negotiation*
    - *Whiteboarding*
    - *Tools & Strategies*



Machine Learning

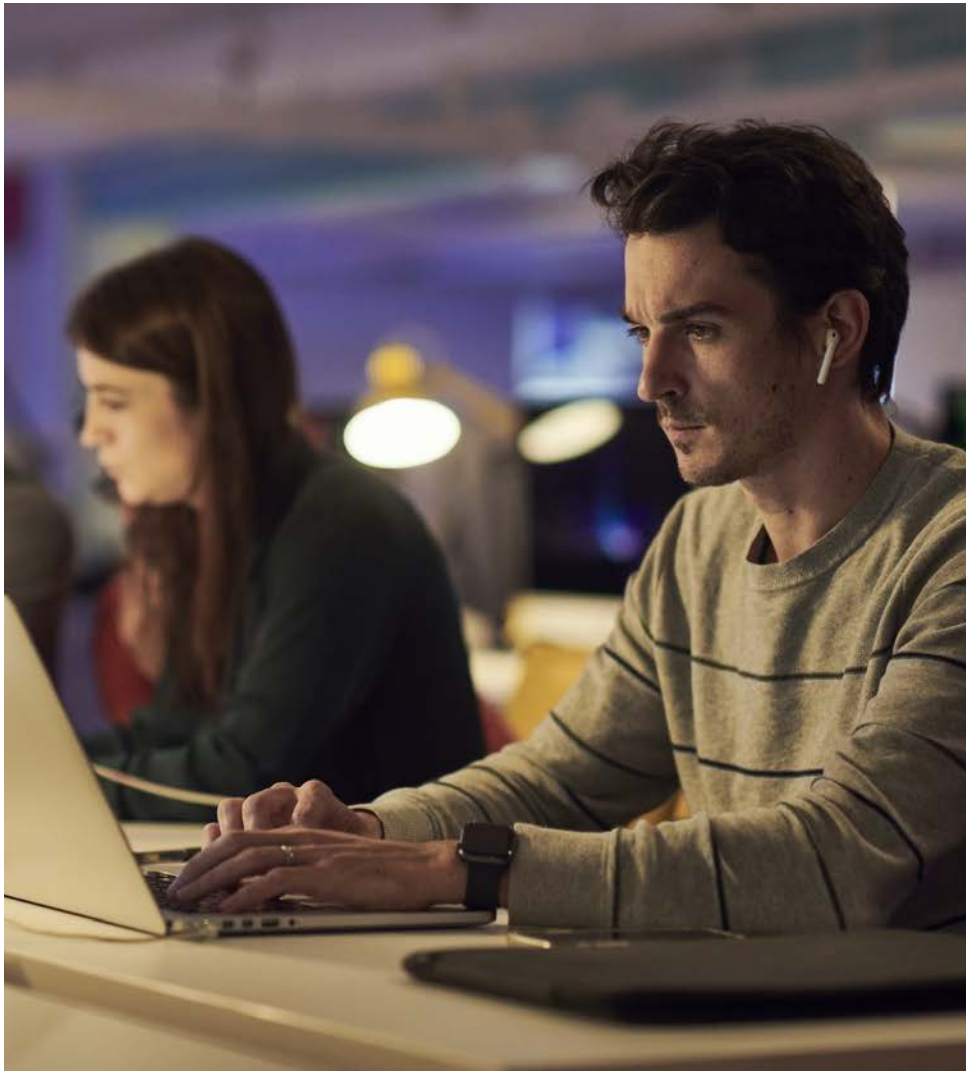
Holberton

Machine Learning

Holberton's **machine learning specialization** teaches the theories behind modern-day breakthroughs in the fields of computer vision, natural language processing, recommender systems, autonomous driving, and more.

Students will also learn how to apply these concepts using technologies such as **Pandas, Numpy, Tensorflow**, and **Keras**. Throughout their **nine months of study**, students will **dive deep into supervised, unsupervised and reinforcement learning**, as well as the related **mathematical principles**.

Recent advances in this field have **sparked a fourth industrial revolution**, accelerating the rate of automation and scientific discoveries. Entering such a field now will inevitably **help shape society's progress for decades to come**.



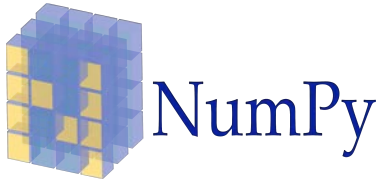
Machine Learning

Mathematics

- Matrix operations
- Normalization
- Eigenvalues and Eigenvectors
- Plottong
- Summation and product notation
- Derivatives and partial derivatives
- Integrals
- Marginal and conditional probabilities
- Probability distributions
- Bayesian probability
- Mixture models

Supervised Learning

- Multi-layered neural networks
- Forward and back propagation
- Stochastic gradient descent
- Weight and bias initialization
- Bias and variance tradeoff
- Regularization
- Convolutional neural networks
- Deep convolutional architectures
- Recurrent neural networks
- Transformers
- Sequence-to-Sequence modeling



Machine Learning

Unsupervised and Reinforcement Learning

- Dimensionality Reduction
- Clustering
- Embeddings
- Autoencoders
- Generative Adversarial Networks
- Hyperparameter Optimization
- Hidden Markov Models
- Monte Carlo Method
- Deep Reinforcement Learning

Project Examples

- Object Detection
- Facial verification
- Neural Style Transfer
- Speech to Text
- Machine Translation
- Stock predictions
- Recommender systems
- Game agents

The Pipeline

- Web scraping
- Labeling data
- SQL & NoSQL databases
- Map Reduce
- Hosting on cloud platforms

Augmented Reality / Virtual Reality

Holberton

Augmented Reality / Virtual Reality

Holberton's **Augmented Reality / Virtual Reality (AR / VR)** curriculum teaches the fundamentals of **programming in C#** and developing **interactive mixed reality projects in Unity3D**, the world's leading real-time game engine.

Throughout the nine months, students will learn Unity3D concepts such as **scripting, animation, UI design, creating shaders, game testing**, as well as learning UX concepts specific to AR and VR, including **immersive storytelling, spatial audio, and user comfort**.

Mixed reality is a young, evolving industry and becoming involved now **means shaping and influencing the future of the field.**

Augmented Reality / Virtual Reality

C# curriculum

- If/else statements, loops, functions
- Data structures
- Exceptions
- Structs, classes, namespaces
- Algorithmic problem solving
- Test-driven development
- Linear algebra
- Interfaces
- Generics
- Delegates
- Events

Unity curriculum

- Unity workflow and best practices
- Unity scripting and Unity-specific C# patterns
- UI design
- Animation
- Audio
- Lighting/rendering
- Shader programming
- Game testing
- UX for AR/VR
- Accessibility
- Developing for multiple platforms

Augmented / Virtual Reality

Project examples

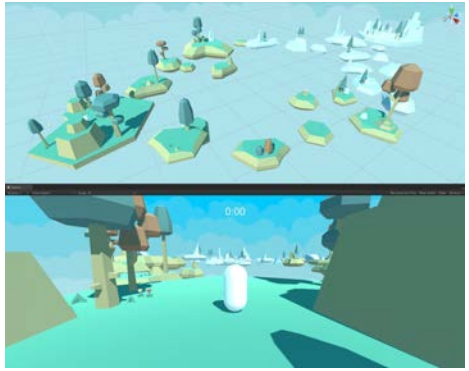
VR:
- 360 video
- Seated/standing experience
- Room scale experience

AR:
- Marker-based recognition
- Location-based application
- Plane detection / physics game

Concepts

VR:
- Methods of navigation
- Designing for 3DOF vs. 6DOF
- User comfort

AR:
- SDKs (ARCore, ARKit, Vuforia)
- UI/UX design
- Accessibility



Development of the 3D game project

Development of the AR image recognition project

Development of the VR room project

Development of the VR 360 video project

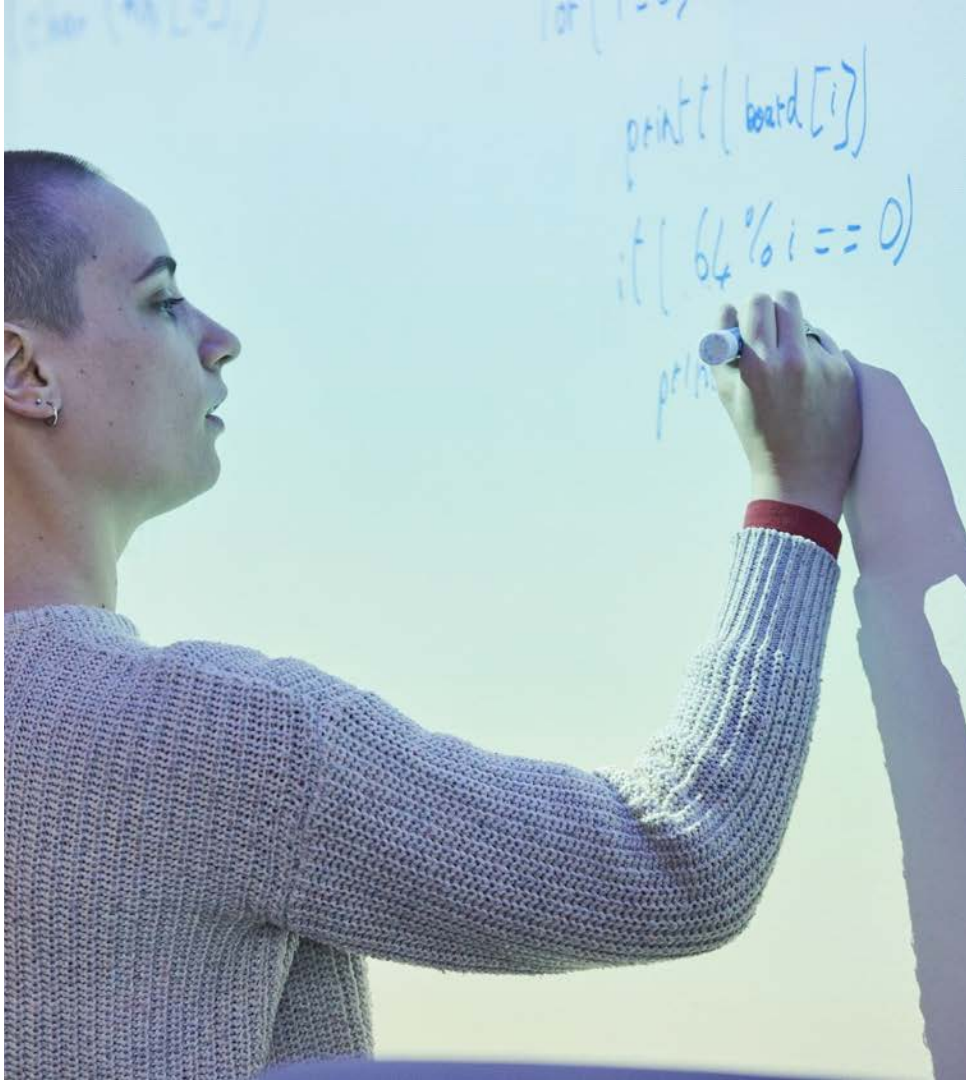
Low Level and algorithms

Holberton

Low Level and algorithms

Holberton's **low-level programming specialization** allows students to **dive into the complexity of the C programming language and the Linux operating system**. Students will also be challenged with advanced data structures and algorithms, and they will uncover all the **mechanisms behind the Blockchain technology** by building their own basic cryptocurrency from scratch, entirely in C.

This **specialization** builds a great foundation if you aim to become a fast-growing Software Engineer as it will **widely develop your understanding of "how things work under the hood**".



Low Level and Algorithms

This first part of the low-level curriculum is an extension to Holberton's first year program. Students will extend their knowledge of the C programming language and the Linux system throughout more complex projects.

These advanced concepts include but are not limited to:

Linux and C programming

-File streams
-The Linux programming
-Interface: system calls
-Memory management
-Process tracing
-IPC:Inter-Process Communication
-The ELF file format
-Assembly with Intel x86
-The Linux filesystem

Low Level and Algorithms

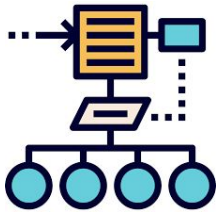
Data Structures and Algorithms

This next part of the low-level curriculum is designed to introduce students to complex, yet widely used data structures and algorithms. Data structures and algorithms are a means of manipulating and transforming data. They help developers solve problems in a reliable and maintainable way.

These advanced data structures and algorithms include:

Data structures and algorithms

-Advanced trees
-Graphs
-Compression algorithm
-Pathfinding



Blockchain

This last part of the low-level specialization teaches students how to build their own Blockchain, and extend it to a basic cryptocurrency. The whole project will be built from scratch and entirely in C.

Blockchain is a very big trend, and it not only applies to the software industry, but to many others, such as banking, health, telecommunication, and more. By the end of this big project, students will have a strong understanding of what makes the Blockchain technologies so reliable and secure.

Here is a non-exhaustive break down of what this project covers:

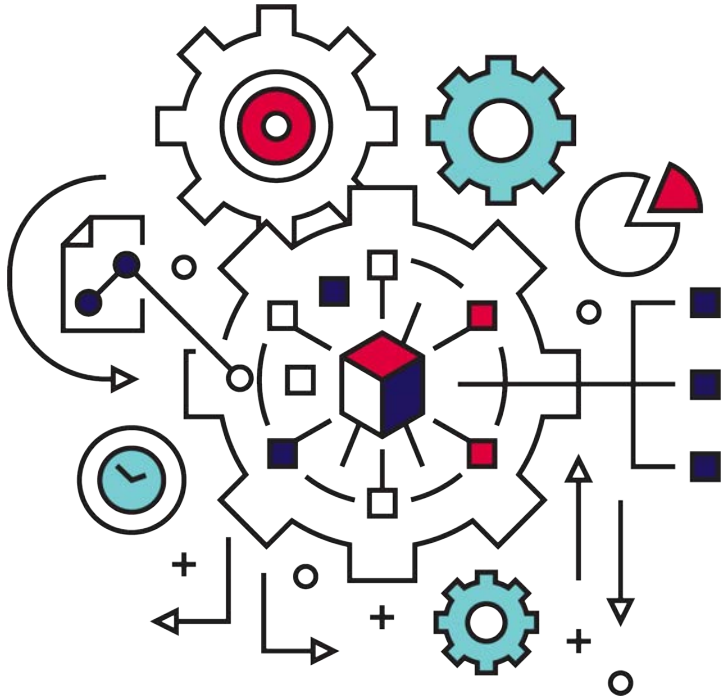
Blockchain

-Cryptography in the blockchain
-The Blockchain data structures implementations in C
-Block mining
-From Blockchain to cryptocurrency

Low Level and Algorithms

Project Examples

- Shell v2
- Strace
- Create your own Malloc
- Build a simple HTTP REST API in C
- Mastery of Red - Black Trees
- Execute advanced algorithm design
- Parsing ELF files
- Blockchain Implementation in C



Full-Stack Web Development

Holberton

Full-stack web development (Available Jan 2020)

Holberton's web stack specialization advances the web development principles and skills introduced in Foundations. During the specialization, students approach and build various web applications - utilizing the most **recent frameworks**.

Students will learn **advanced skills** in **front-end**, **back-end,** and **React** development, mastering frameworks that are in high-demand throughout the industry.

Whether it's front-end, back-end, React- specific or full-stack engineering, this curriculum prepares students to create, maintain, and improve **web applications and APIs**, some of which are used every day.

By following this specialization, students will be well-versed in **HTML, CSS, Advanced Javascript, Advanced Python, ReactJS, Redux, SASS, responsive design, Accessibility, ES6, NodeJS, NoSQL, MySQL advanced, Redis, User Authentication** , and more. The end of each trimester has a **web-focused portfolio project** culminating the content learned.

Full-stack Web Development

Front-End

- Advanced HTML / CSS
- Developer Tools
- SCSS
- Flexbox
- Responsive Design
- Accessibility
- Working with Designers
- Design Implementation
- Bootstrap
- Advanced Javascript
- Advanced JQuery
- Cookies & Local Storage
- ES6
- Webpack
- Building Portfolio Applications

Back-End

- Advanced Python
- Advanced SQLAlchemy
- User Data Protection
- Encryption
- Authentication
- Caching
- Unittests / Integration Testing
- Redis
- I18n
- Advanced MySQL
- NoSQL
- Queuing Systems
- Intermediate TypeScripting
- Building Portfolio Projects

React

- Continued Advancement of HTML / CSS
- Intermediate ES6
- TypeScript
- React I
  - Intro
  - Props
- React II
  - State
  - Immutable
  - Inline-styling
- React Redux
- React Portfolio Project

Full-stack Web Development

Project Examples

- Integrate designer specifications
- User authentication system
- Background job/queuing system
- Bootstrap app from designer brief
- React portfolio app

Career Track*

**This option is not available in the San Francisco location due to CA regulation*

Holberton

Career Track: Career Sprint & On-the-job training*

After foundations, if a student chooses to seek employment, they will first complete a Career Sprint to better prepare for the road ahead and then, find employment.

Career Sprint: Designed to keep students accountable during the job search process. The Career Sprint helps students build processes and get connected to resources that will be helpful throughout the entirety of their professional careers. Once completed, students will be fully prepared for their first work opportunities.

On-the-job training: Once a student finds a full-time employment opportunity meeting all of our criteria, and invests a specified duration of commitment to it, they are then considered a graduate. Continued support from Holberton during this phase of a student's journey helps build lasting skills.

This option is not available in the San Francisco location due to CA regulation.

Career Sprint*

Portfolio Projects

- Craft a personal narrative
- Author a tech-focused resume
- Polish Github repository documentation
- Publish a personal website to showcase portfolio
- Optimize profiles on LinkedIn/Social Media

Process Projects

- Learn different interview formats
- Gain confidence in in-person and virtual networking
- Define a job search strategy
- Learn tools and platforms for sourcing and applications
- Understand compensation and best negotiation practices

Practice Projects

- Build (more) confidence in whiteboarding
- Algorithm review
- Practice specialized interview skills for specific roles
- Leverage tools and platforms for interviewing practice
- Deliver personal narrative in mock behavioral interviews

This option is not available in the San Francisco location due to CA regulation.

Ready to define your future?

Start your application now by following the links below:

- USA
- COL
- TUN