BILD 62: Last Day!

Class updates

- Code review (from Tuesday) due Friday at 5 pm
- SET evaluations by Saturday morning
- Take the extra credit survey before tomorrow (Friday) at midnight

Regardless of how you collaborate, in the end, everyone needs to submit via **DataHub** AND **Canvas**

so that we can test your code

so that we can leave comments

No need for data files; ONLY ONE PER GROUP!

PLEASE INCLUDE YOUR DATA FILES!
Only one per group is fine

Error handling

Error Handling *(15 points)*	Very little error handling strategies within code	Code implements some error handling strategies but misses several cases	If data: code is resilient to multiple file types OR is clear about what data structure should be, giving clear messages if it does not meet specifications. If user interaction: code should handle various inputs and should be resilient to user error. Regardless: code should use some error catching strategies, such as assert, try/except, and unit tests

BILD 62 project rubric

Different ways to handle error catching

Mandatory: Messages to the user & breaking the code

- If something, print(‘This isn’t working.’); break

Optional alternative: try/except

- `try` a certain operation, `except` do something else

De-bugging tricks

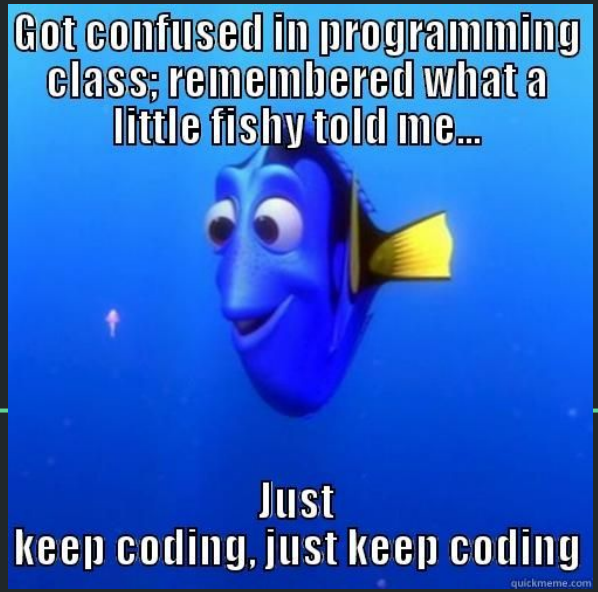
- Unit tests
    - Trying a **known example** with a function and asserting that it gives the expected result.

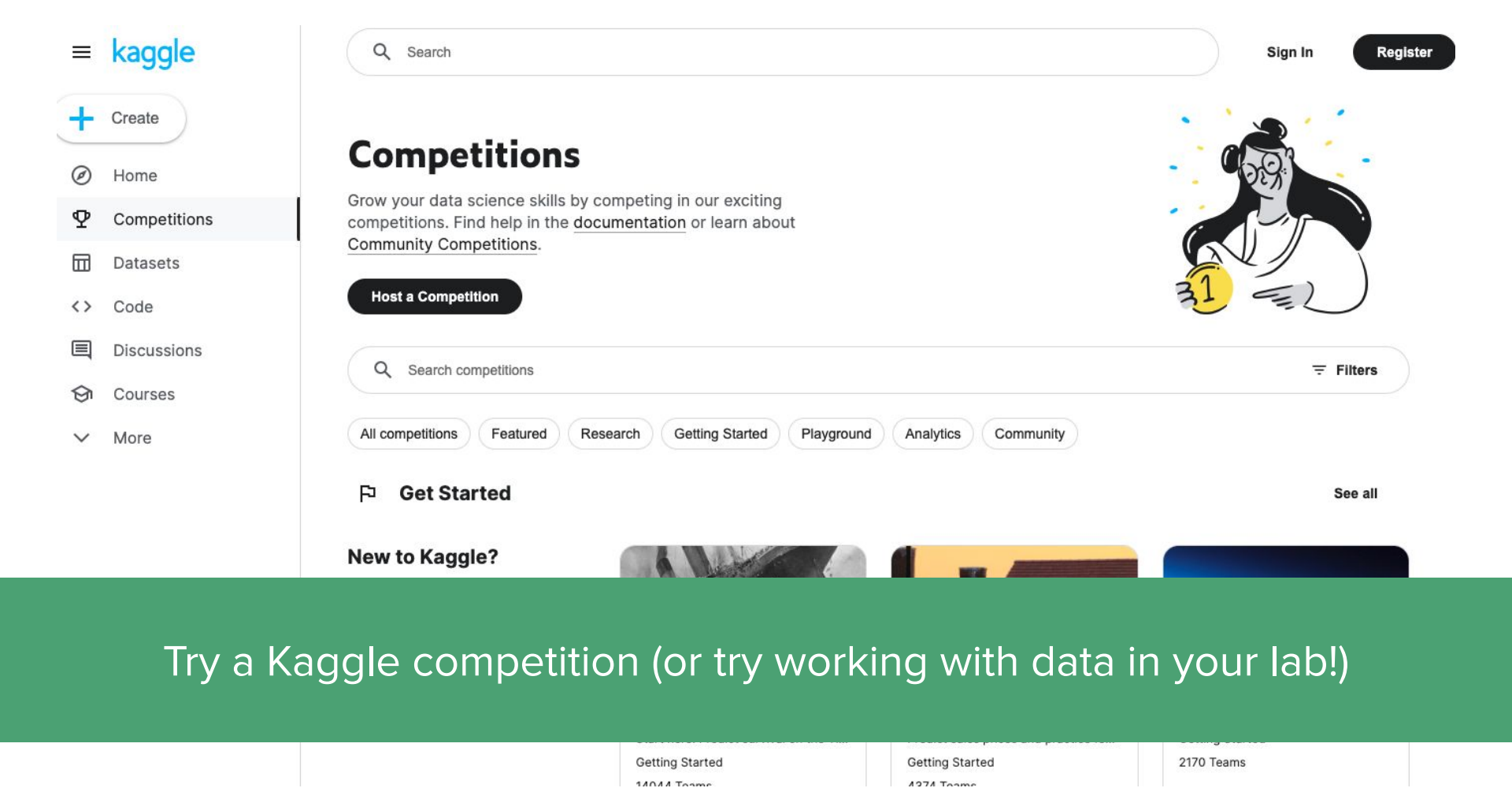
So, how did we do?

Course Objectives

- ★ Read and run basic Python programs, recognizing the structures used (i.e. variables, conditionals, loops, functions) and explaining how they work
- ★ Manipulate and create objects in Python, including data structures and classes
- ★ Write, edit, and execute Python code in Jupyter Notebooks as well as the command line
- ★ Visualize and ~~run hypothesis-testing~~ on simple datasets in Python
- ★ Implement common algorithms for analyzing biological data (e.g., time series, images) and determine when such computations are appropriate

How can I keep learning?



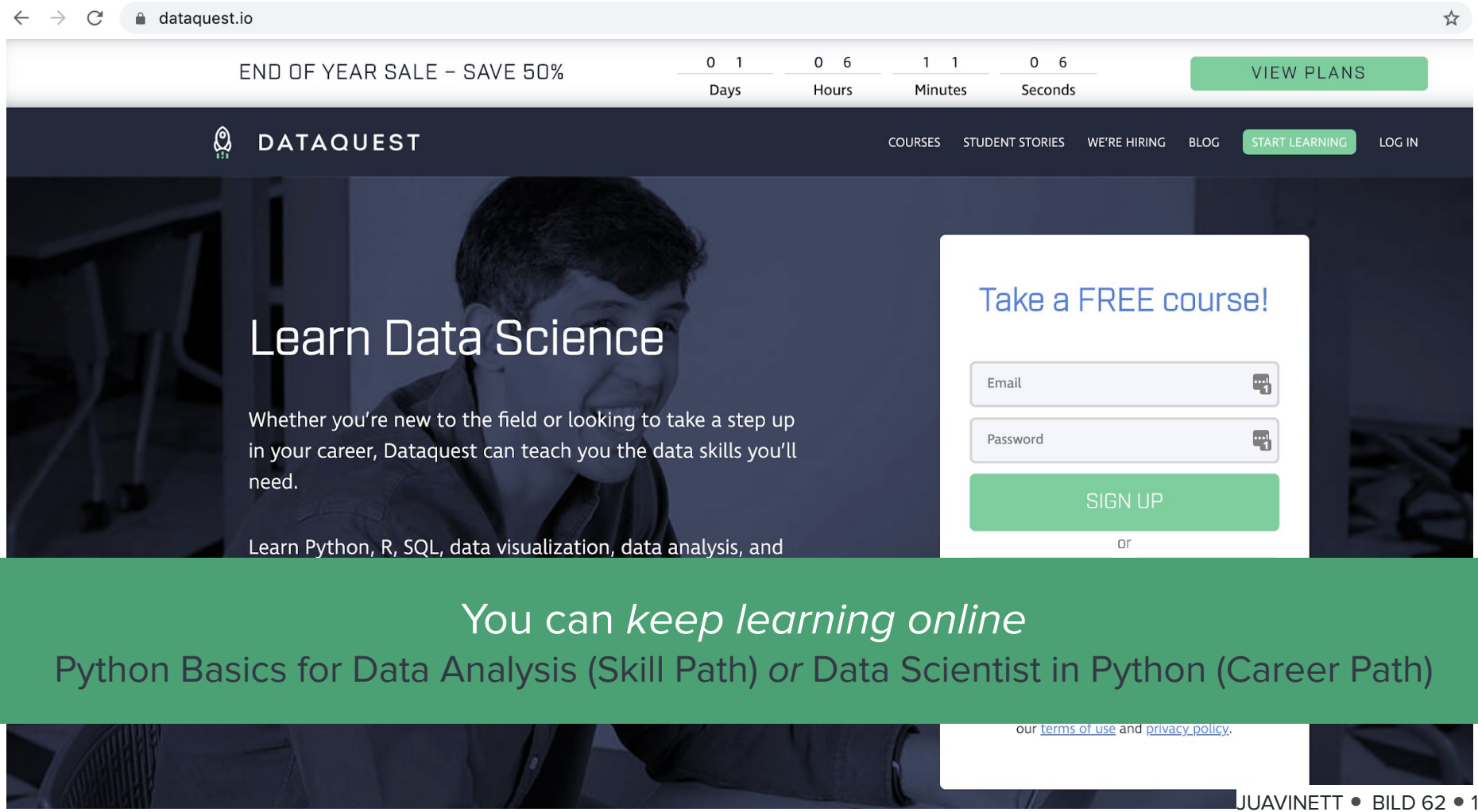


Try a Kaggle competition (or try working with data in your lab!)

Topics and Subjects

Course Title	Course Description	Course Link	Next Course Dates
Computational Neuroscience	The curriculum integrates cutting-edge advances in machine learning and causality research with state-of-the-art modeling approaches in neuroscience.	See Course Details and Upcoming Dates	July 8-26, 2024
Deep Learning	Our Deep Learning (DL) course grew out of the realization that there is a real need for teaching an ethically responsible hands-on TA-guided code-first DL curriculum that emphasizes how DL can be used to advance science and achieve better scientific insights.	See Course Details and Upcoming Dates	July 8-26, 2024
Computational Tools for Climate Science	Through this program, students will gain skills and knowledge in the areas of climate science and impact, computational methods, data access, and scientific practices.	See Course Details and Upcoming Dates	July 15-26, 2024
NeuroAI	What are common principles of natural and artificial intelligence? The core challenge of intelligence is generalization. Neuroscience, cognitive science, and AI are all questing for principles that help generalization.	See Course Details and Upcoming Dates	July 15-26, 2024

Neuromatch Courses



You can *keep learning online*

Python Basics for Data Analysis (Skill Path) *or* Data Scientist in Python (Career Path)

Other online courses

[Applied Computational Genomics @ U. of Utah - YouTube]

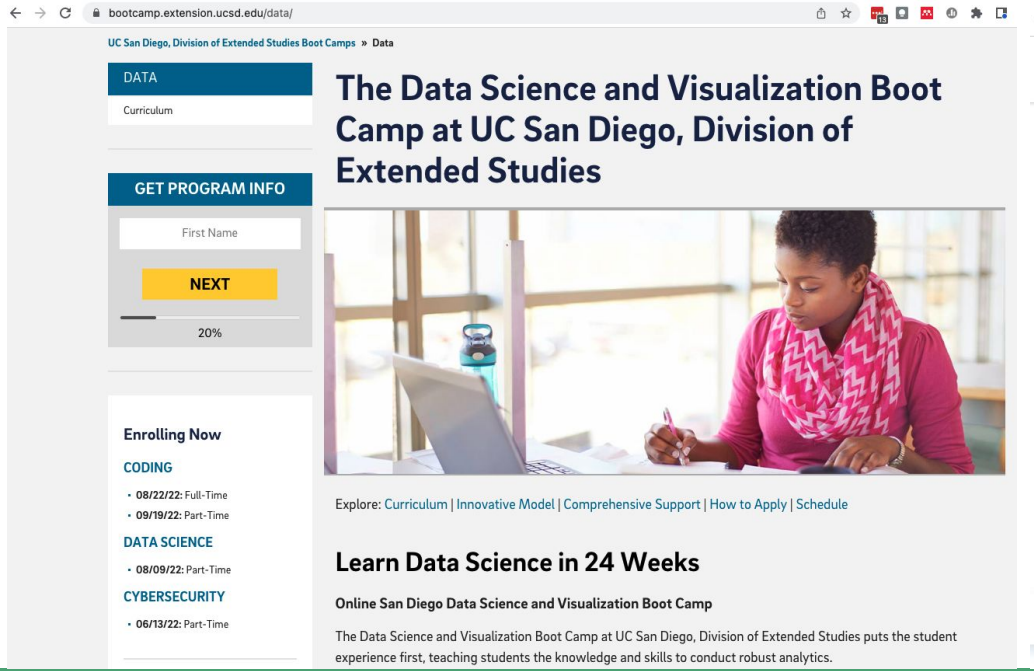
[MIT Deep Learning in Life Sciences - Spring 2021 - YouTube]

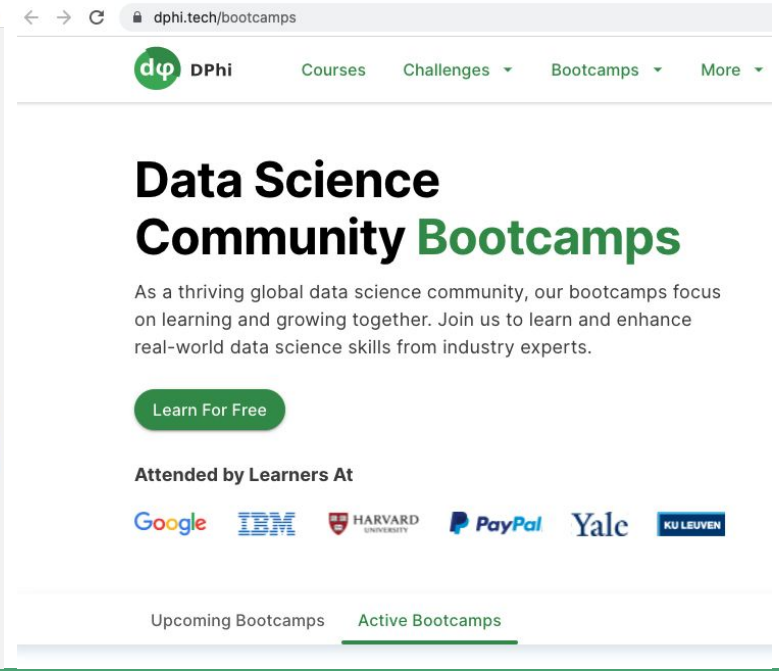
[Missing Semester IAP 2020 - YouTube]

[https://carpentries.org/workshop]

[Hypermodern Python · Claudio Jolowicz s/]

List curated by Fernando Pozo (Original Tweet)





Sign up for a Data Science bootcamp

Create your own personal portfolio *(on Github!)*

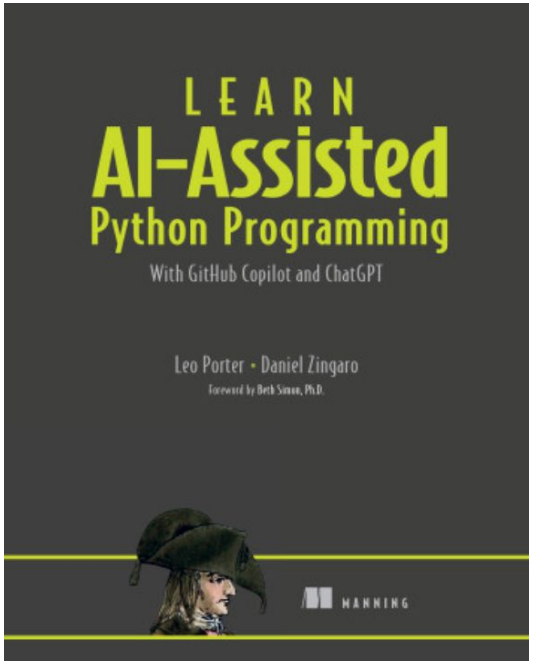
Using Personal Projects to Land Your First Job in Tech

Nick Kolakowski
Jun 27, 2024
3 min read

From: https://www.dice.com/career-advice/using-personal-projects-to-land-your-first-job-in-tech

Continue learning alongside AI assistants

Just make sure you *understand* what the code is doing!!!!



Porter & Zingaro (2023) *Learn AI-Assisted Python Programming — entire book on using Copilot & VS Code!*

Courses at UCSD

Biology classes

BIMM 143. Bioinformatics Laboratory (4). Bioinformatics is the analysis of big data in the biosciences. This course provides a hands-on introduction to the computer-based analysis of biomolecular and genomic data. Major topic areas include advances in sequencing technologies, genome resequencing and variation analysis, transcriptomics, structural bioinformatics, and personal genomics. This course will utilize free, web-based bioinformatics tools and no programming skills are required. Prerequisites: BILD 1 and BILD 4 or BIEB 123 or BIMM 101.

BIMM 149. Computation for Biologists (4). Course will provide students with the computational tools and problem-solving skills that are increasingly important to the biosciences. Students learn to program in a modern general-purpose programming language and write their own programs to explore a variety of applications in biology including simulations, sequence analysis, phylogenetics, among others. Prerequisites: BILD 1 and BILD 2.

BIPN 164 Computational Models and Theories in Neuroscience - New course - effective Winter 2022. This course covers mathematical models of neurons, synapses, and neural networks. We will introduce theoretical frameworks of brain activity and function to understand neural computation and control of behavior. We will discuss network dynamics, synaptic plasticity, learning and memory. Students will apply modeling approaches to address scientific questions and make predictions for experiments. Prerequisites: MATH 10A or MATH 20A and MATH 10B or MATH 20B and MATH 11

Biology classes (continued)

BIPN 162. Neural Data Science (4) Project-based course in which students will use computational notebooks to perform exploratory data analyses and to test hypotheses in large neuroscience data sets, including the differences between unique neuron types, leveraging text mining of the neuroscience literature, and human neuroimaging analyses. Prerequisites: MATH 11 and BIPN 140 and BILD 62 or COGS 18 or CSE 8A

Neural Data Science (BIPN 162 or COGS 138)

By the end of this course, you'll be able to:

- Develop hypotheses specific to big data environments in neuroscience
- Design a big data experiment and excavate data from open sources
- Integrate data from multiple datasets to answer a biological question

Cognitive science classes

COGS 9. Introduction to Data Science (4). Concepts of data and its role in science will be introduced, as well as the ideas behind data-mining, text-mining, machine learning, and graph theory, and how scientists and companies are leveraging those methods to uncover new insights into human cognition.

COGS 118A. Supervised Machine Learning Algorithms (4). This course introduces the mathematical formulations and algorithmic implementations of the core supervised machine learning methods. Topics in 118A include regression, nearest neighborhood, decision tree, support vector machine, and ensemble classifiers. COGS 118A-B may be taken in either order. Prerequisites: COGS 18 or CSE 8B or CSE 11 and MATH 18 or MATH 31AH and MATH 20E and MATH 180A and COGS 108 or COGS 109 or COGS 118B or CSE 150 or CSE 151 or CSE 158 or ECE 174 or ECE 175A or consent of instructor.

COGS 118B. Introduction to Machine Learning II (4). This course, with COGS 118A, forms a rigorous introduction to machine learning. Topics in 118B include maximum likelihood estimation, Bayesian parameter estimation, clustering, principal component analysis, and some application areas. COGS 118A-B may be taken in either order. Prerequisites: CSE 8B or CSE 11 and MATH 18 or MATH 31AH and MATH 20E and MATH 180A or consent of instructor.

Cognitive science classes (*continued*)

COGS 118C. Neural Signal Processing (4). This course will cover theoretical foundations and practical applications of signal processing to neural data. Topics include EEG/field potential methods (filtering, Fourier (spectral) analysis, coherence) and spike train analysis (reverse correlation, spike sorting, multielectrode recordings). Some applications to neural imaging (optical microscopy, fMRI) data will also be discussed. Prerequisites: MATH 18 or MATH 31AH, COGS 14B or PSYC 60, and COGS 108 or COGS 109.

COGS 118D. Mathematical Statistics for Behavioral Data Analysis (4). Statistical methods for analyzing behavioral data. A mathematically sophisticated course covering both classical and Bayesian statistical methods for estimation, hypothesis testing, regression, and model comparison. Emphasis on both mathematical understanding of statistical methods as well as common applications. Prerequisites: MATH 18 or MATH 31AH and MATH 180A or consent of instructor.

COGS 119. Programming for Experimental Research (4). This course will help students in the behavioral sciences (cognitive science, psychology, linguistics, neuroscience, and related fields) learn how to program experiments and analyze and present data. Prerequisites: COGS 14B and MATH 18 or MATH 31AH and MAE 8.

COGS 138. Project-based course in which students will use computational notebooks to perform exploratory data analyses and to test hypotheses in large neuroscience datasets, including the differences between unique neuron types, leveraging text mining of the neuroscience literature, and human neuroimaging analyses. Prerequisites: COGS 18 and COGS 118C.

A path into advanced COGS classes...

Course name & description	**MATH 189** Quantitative techniques for analyzing big data	**COGS 118A** Supervised Machine Learning Algorithms	**COGS 118B** Introduction to Machine Learning	**CSE 158** Data Mining
Prerequisites	MATH 18 or 20F or 31AH MATH 20C MATH 183 *Uses R?*	COGS 18 MATH 18 MATH 20E MATH 180A COGS 108/109 *Uses Python*	CSE 8B or CSE 11 MATH 18 MATH 20E MATH 180A	DSC 40B DSC 80 MATH 183

Visual Arts classes

The **Interdisciplinary Computing and the Arts major** draws upon and aims to bring together ideas and paradigms from computer science, art, and cultural theory. https://visarts.ucsd.edu/undergrad/major-req/icam.html

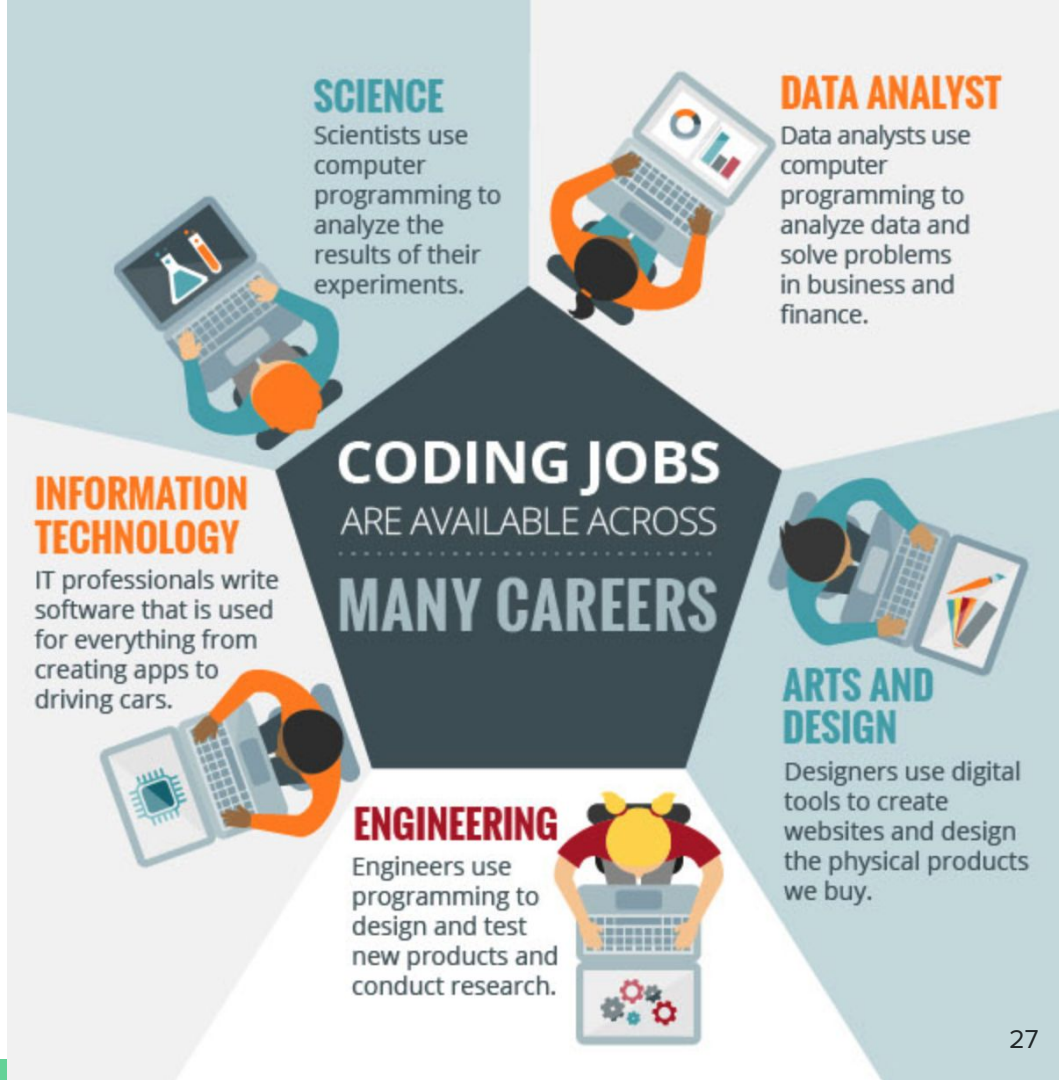
https://visarts.ucsd.edu/_files/curriculums/ICAM%20Curriculums/ICAM-Curriculum-Sheet-FA21-and-Later1.pdf

Careers after BILD 62

Why should I learn how to code?

- Coding is useful for:
  - Data acquisition (controlling hardware, image acquisition, etc)
  - Data analysis & visualization
  - Computational modeling
- Beyond research, there are more and more jobs for software engineers, and they pay well

(see report by Burning Glass: https://www.burning-glass.com/research-project/coding-skills/)



Consider coding long term...

- Jobs requiring coding pay ~$22K more a year
- Programming jobs are growing faster than market average

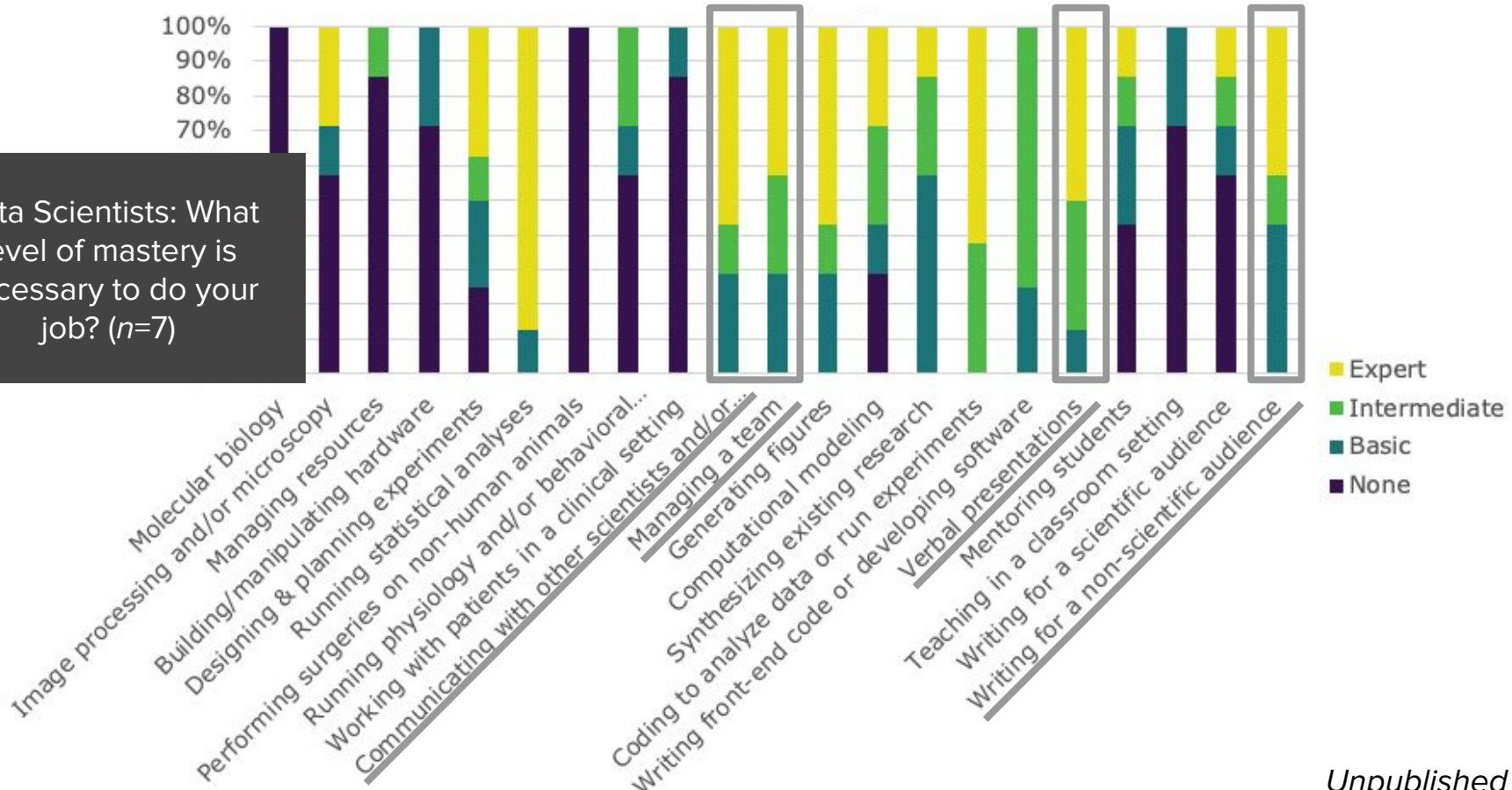
TABLE 2: DEMAND AND GROWTH OF CODING JOBS

Role Type	2015 Openings (Source: Burning Glass)	Projected 10-Year Growth (Source: BLS)
Information Technology	3,747,340	8.8%
Data Analysis	1,452,446	7.7%
Engineering	938,126	2.9%
Science	330,896	6.3%
Arts & Design	300,323	8.2%
All coding jobs	6,769,131	7.2%
Other jobs (occupations paying >$15/hr)	30,759,008	6.4%

From Burning Glass (Job Analytics Firm) 2016 Analysis

Other skills are still important!!!

Data Scientists: What level of mastery is necessary to do your job? (*n*=7)



Unpublished data

Thanks for a great quarter.