Outline

Planned topics for this lesson:

- What is Software?

  Yes, you probably know what is a software — but how about commercial software, open-source software, freeware, shareware, SaaS

- Functional vs Non-functional requirements in software development

  It's pivotal to know the difference between the two — these concepts collectively shape the foundation of effective software engineering practices

- What is Software Engineering?

  Because you need a job in IT as software engineer? Or you don't want to blow stuffs later when you are a software engineer?

- What are (development) frameworks?

  There's a lot to unpack here (and hard to keep-up) — ruby on rails, django, react, angular, unity, flask, spring-boot, tensor-flow, pytorch, andruino ... and on top of that, what is bootstrapping ???

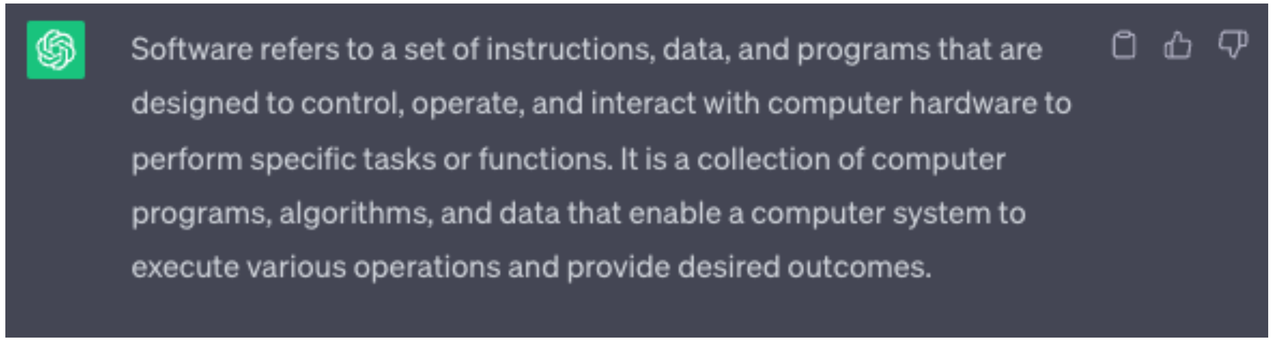
What is Software?

- **A set of instructions that tell your computer what to do !**
- Textbook definition:

  I) Instruction (computer programs) that when executed provide desired features, function and performance

  II) Data structures (Arrays, Object, List, Dictionary, Map) that enable programs to manipulate information

  III) Descriptive information in both Hard Copy and virtual format describing the operation and use



DESIGN
Adobe Photoshop
Top graphic design/editing tool

PRODUCTIVITY
Gmail
Top mailing client

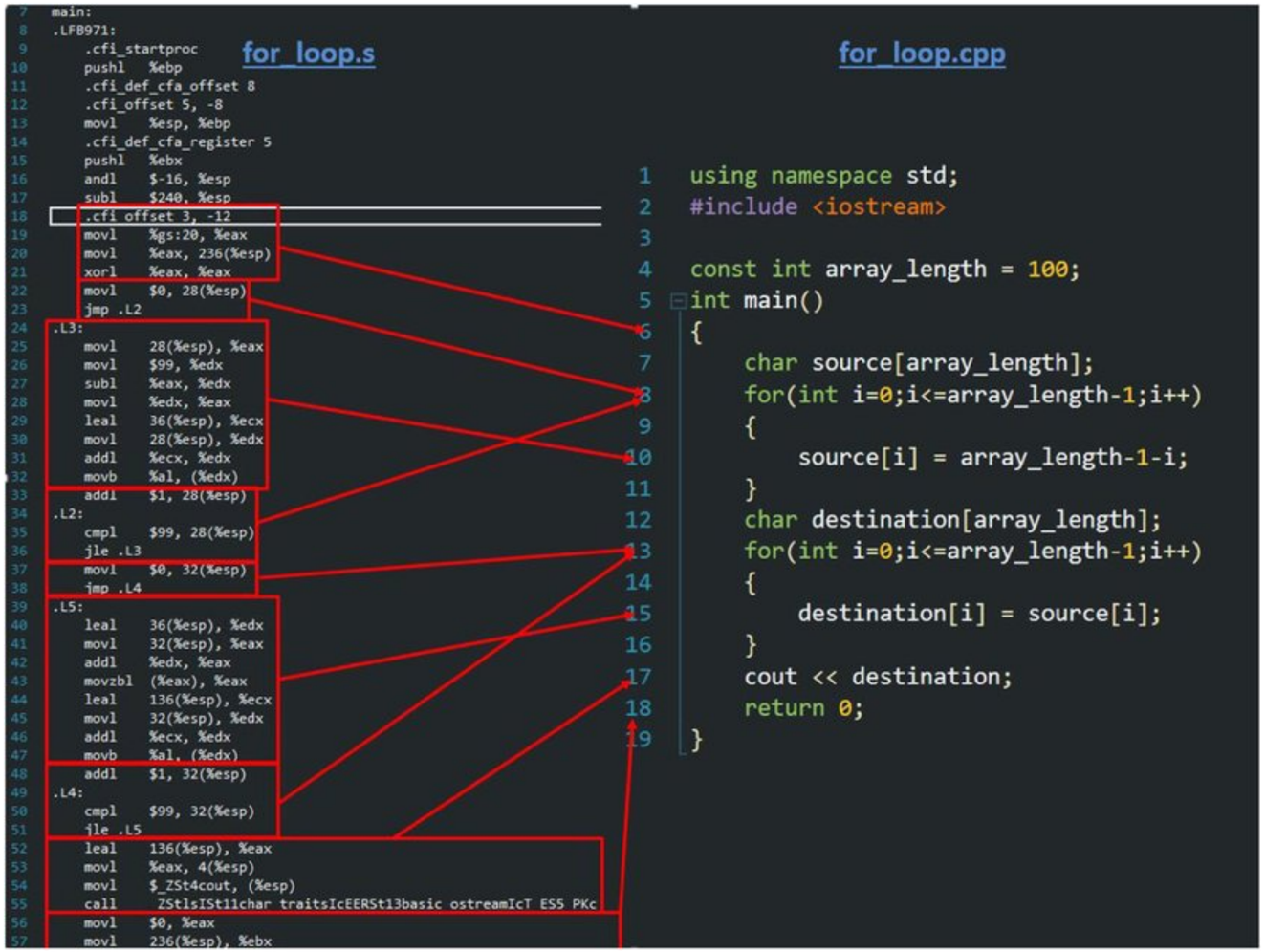
PRODUCTIVITY
Google Chrome
Most popular web browser

PRODUCTIVITY
Microsoft Office Excel
Top Spreadsheet tool

PRODUCTIVITY
Microsoft Office PowerPoint
Top Presentation Program

COLLABORATION
JIRA
Top Project Management tool

What is Software?



Mapping of Assembly File to Source Code
M. J. Hohnka, et al. (2019)

Evaluation of Computer Induced Vulnerabilities
Journal of Aerospace Information Systems

What is Software?

- Software is a logical rather than physical component of computer based systems
- You can't touch it or taste it, or throw it under a bus
- **What else does it mean?**
  - Software is developed or engineered – it is NOT manufactured in the traditional sense
  - Software doesn't wear-out – there is no physical materials to degrade (and this is not the Matrix)
  - Software is "constructed" using abstract notions of logic (programs / instructions)
  - "Good" software has to meet all specific functional and non-functional requirements

What is Software?

Need for resilient and functionally correct software: e.g., Ariane 5 Rocket

What is Software?

The lesson of this 😱 event :

- The software had tried to cram a 64-bit number into a 16-bit space. The resulting overflow conditions crashed both the primary and backup computers (which are both running the exact same software)
- The Ariane 5 had cost nearly $8b to develop, and was carrying a $500m satellite payload when it exploded.
- The software was originally developed for Ariane 4 rocket — where it worked !

Functional vs Non-Functional Requirement

Functional Requirement	Non-Functional Requirement
Product features	Product property
Describes the actions with which the user's work is concerned	Describes the experience of the user while doing the work
A feature or function that can be captured in use-cases	A global constraint and as such difficult to capture in use-cases
A behaviour that can be analysed via sequence diagrams or state machines	A software quality
Can be usually traced back to a single module / class / function	Usually cannot be implemented in a single module or even program

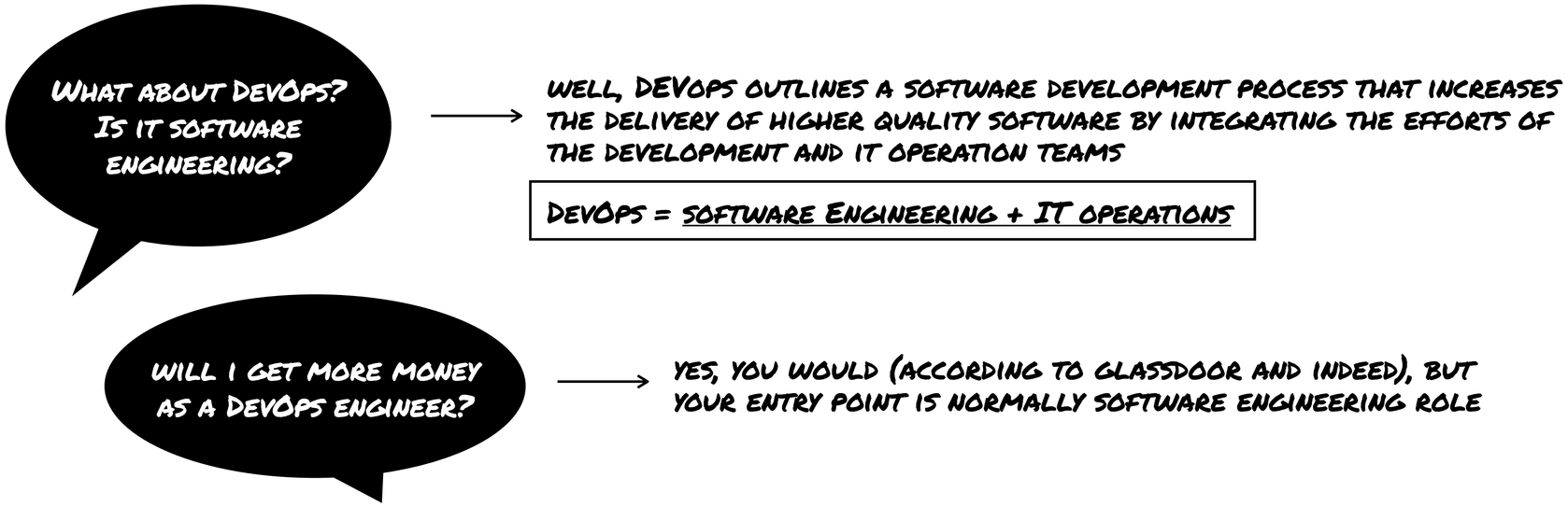
** Typical non-functional requirements include: Availability, maintainability, **performance**, privacy, **reliability**, scalability, and **security**

What is Software Engineering?

- Textbook definition:

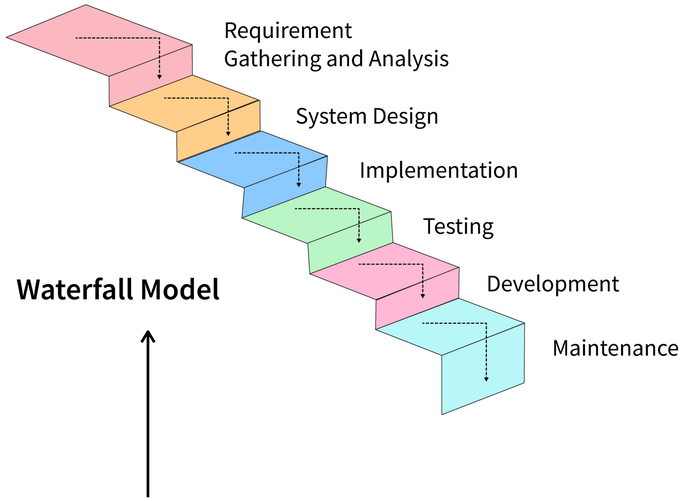
  I) Software Engineering is the field of computer science that deals with the building of software systems that are so large or so complex that they are built by a team or teams of engineers (Ghezzi et al. 2003)

  II) Software Engineering encompasses a process, a collection of methods and an array of tools that allow professionals to build high quality computer software (Pressman)

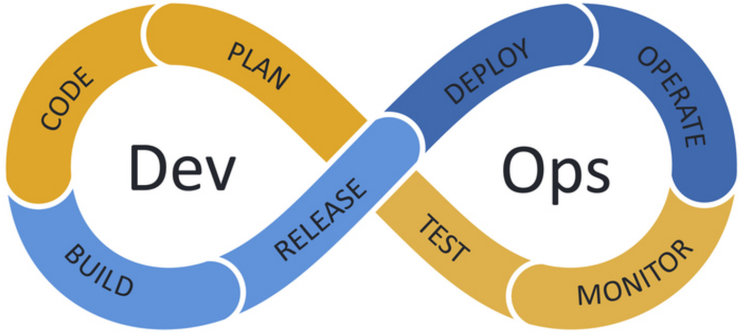


What are Software Development Life Cycles?

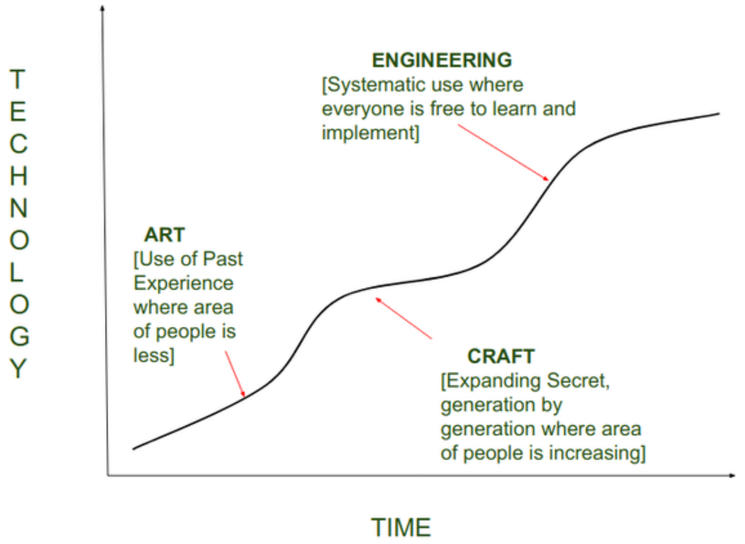
- SDLC refers to a process used by software engineers to design, develop, and test software.
- Each approach focuses on a different aspect of development, from planning to continuous improvement.



THIS "USED" TO BE THE WAY – BUT STILL APPLICABLE, OR COOL ?!



Software Engineering has Evolved



The emergence of trends in Agile software development, based on the first relevant publications in the IEEE and ACM digital libraries

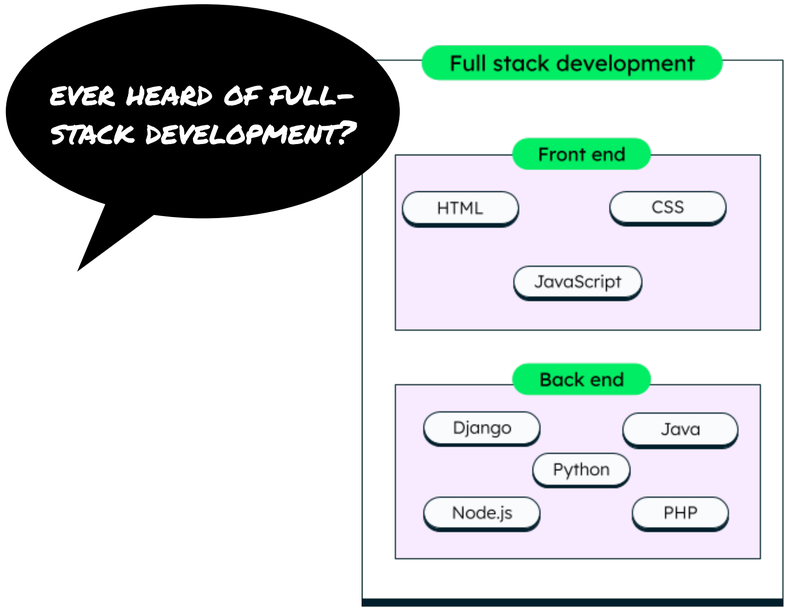
Framework

Software engineers are spending more time configuring frameworks that writing codes !

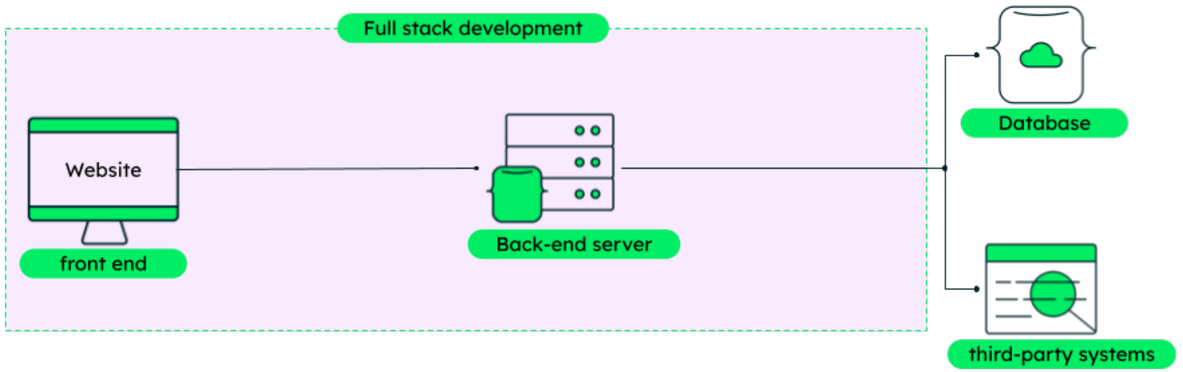
What is a Framework ?

- Software framework (in computer programming) is an abstraction in which common code providing generic functionality can be selectively overridden or specialise by user code providing specific functionality

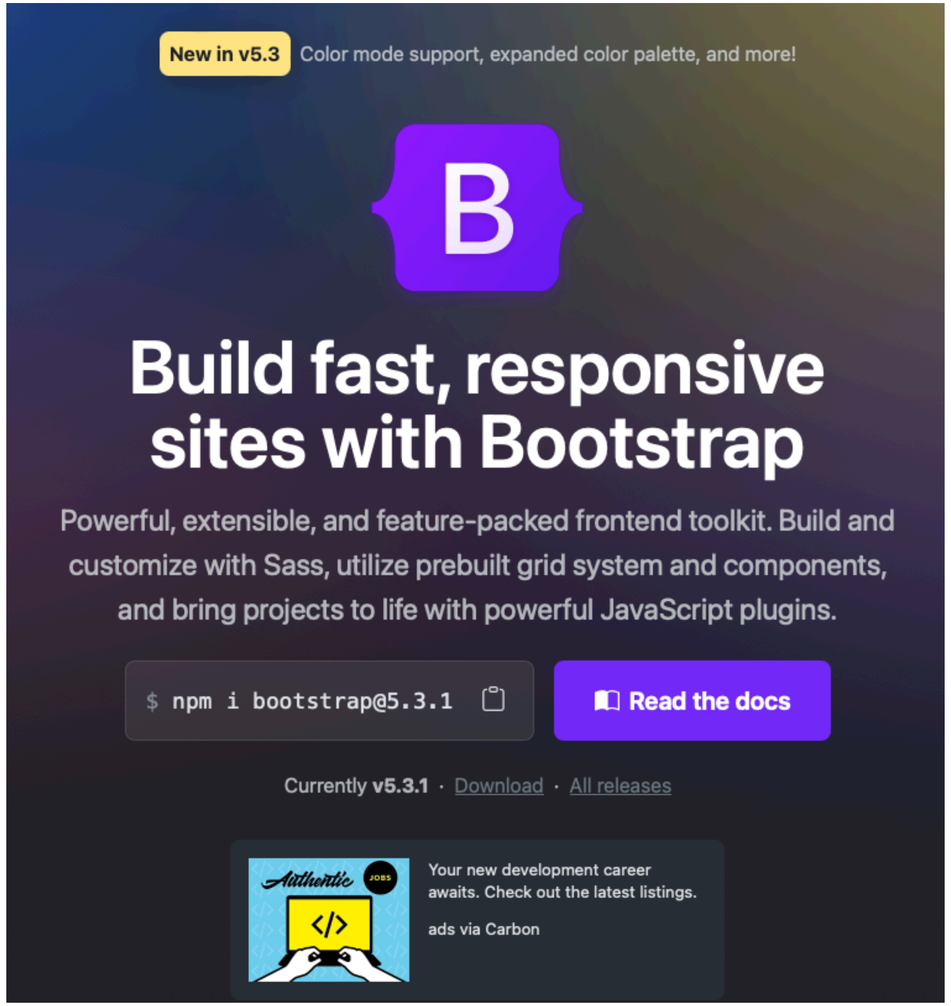
OR SIMPLY, A SOFTWARE DEVELOPMENT TOOL WHERE ALL THE HARD WORK HAS BEEN DONE FOR YOU 😆

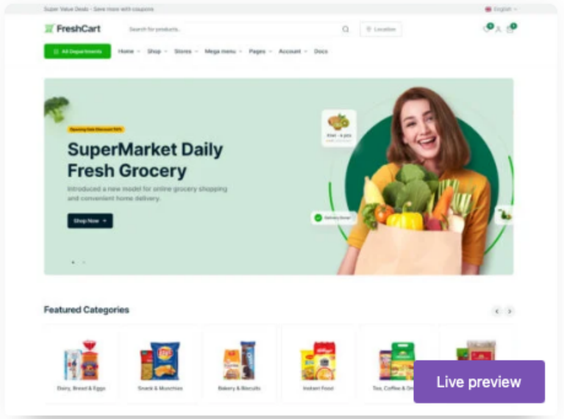


Full stack development refers to the end-to-end application software development, including the front end and back end.

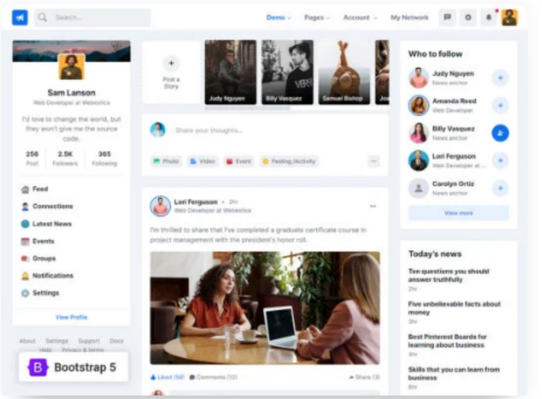


What is a Framework ?

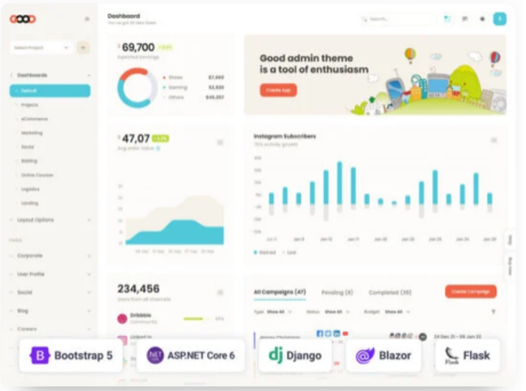




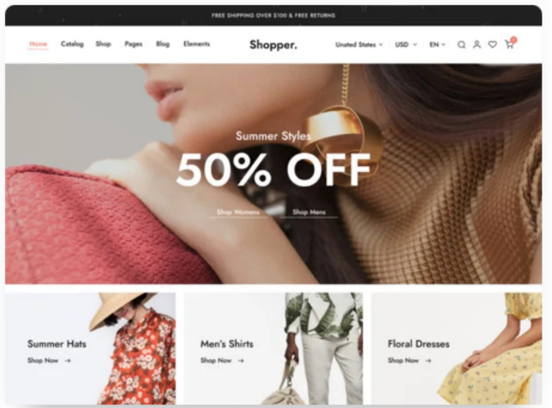
FreshCart – eCommerce HTML Template $49.00
E-Commerce & Retail



Social – Network, Community and Event Theme $49.00
Application

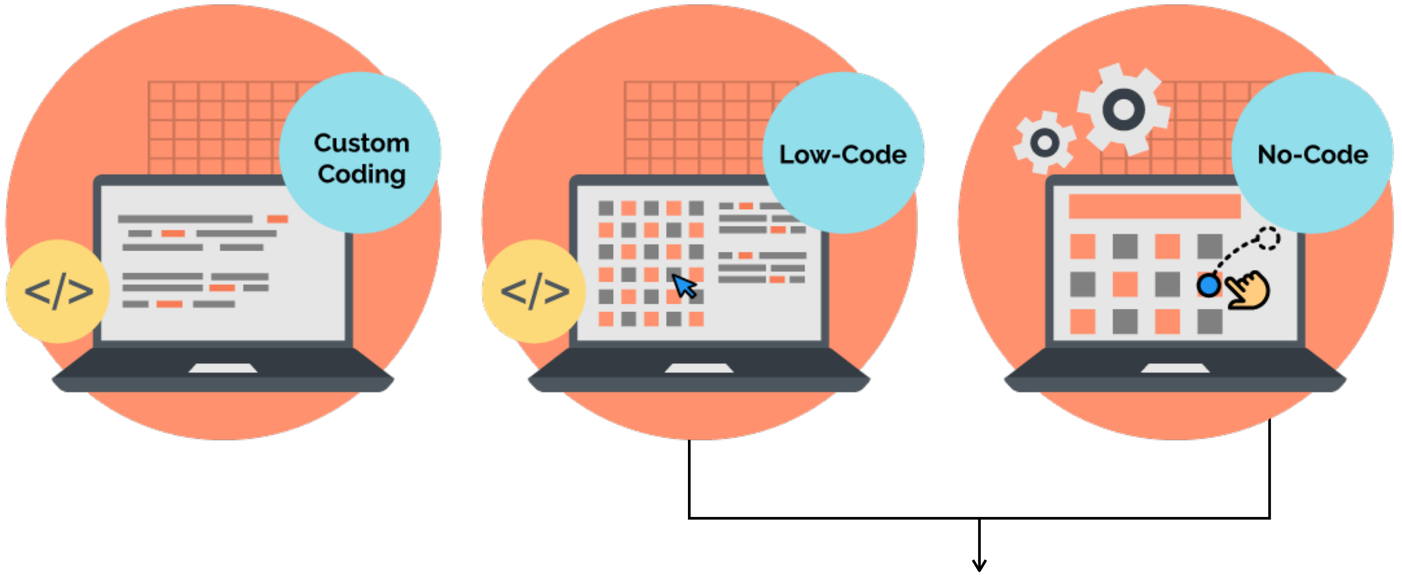


Good – Bootstrap 5 Admin Dashboard Template $49.00
Admin & Dashboard



Shopper – Multipurpose E-Commerce Template $49.00
E-Commerce & Retail

Software Development has Evolved



I) Low-code is a method of designing and developing applications using intuitive GUI and embedded functionalities that reduce traditional pro-code writing requirements.

II) Similar to Low-code, but for non-technical business users allowing them to develop softwares / applications without having to write a single line of code.