Boston University College of Arts and Sciences
Department of Computer Science
111 Cummington Mall
Boston, MA 02215

BU Summer Term CS591SA1

Course title

Application Development Using the MEAN Stack

Overview

This course provides an introduction to creating applications, written in Javascript, using the MEAN stack (MongDB, Express, Angular.js, and Node.js). We will examine each component of the stack from a theoretical standpoint, and then put theory to practice by working on a semester-long programming project using the technologies in combination.

There are several interesting concepts that students might not have been exposed to in the CS curriculum, including:

- Non-relational, document-oriented data stores
- Asynchronous, non-blocking programming using Promises and thenables
- Architectures using internal application programming interfaces (APIs)
- Use of chained and lambda functions

The MEAN stack has grown in popularity over the past several years, and is extensively deployed at companies such as Google, Netflix, NBA.com, Best Buy, and The Weather Channel. The server-side components, Node.js and MongoDB, are horizontally scalable and so are appropriate for high-volume, network-based applications.

Stack overflow's annual developer surveys (n=50,000 this year) shows Javascript to be the dominant language in the industry, with Node.js and Angular.js in the #2 and #3 position in the 'technology I most want to learn' category. There is strong industry demand for full-stack MEAN developers, and this year's survey indicates that Javascript developers can expect to earn an average $100,000 annually in the US.

In this context, a new course covering the fundamentals of this emerging technology will both prepare our existing CS students for an evolving workplace, and will also attract non-CS students who are interested in learning the practical aspects of the MEAN stack. The intensity of a summer session lends itself to a bootcamp style of learning which is appropriate for this kind of material.

Target audience

There are two primary audiences for the course. CS majors with an interest in application design and development will benefit from practical experience in areas that they might have only covered in theory. Core CS courses are taught in languages other than Javascript, and so the course offers an opportunity to add a new programming language to their tool set.

Non-CS majors or CS minors will be attracted to the course because it offers intense, project-based training in a language and technology that is becoming increasingly important in industry. It also gives them a chance to pick up computing skills that will benefit their own areas of study.

Both groups benefit by learning a technology that is highly marketable, either for seniors who are entering the job market or for those looking for technical internships.

Prerequisites

Since this is not an introductory course, it is assumed that students have taken at least one course (or have equivalent experience) in a programming language such as Java, Python, C++, or Javascript. The course will provide a brief introduction to key Javascript concepts during the first week.

Format

This will be a lecture/lab course with at least one hour per week in lab; ideally one or more lectures will take place in the computing lab.

Similar courses

At this time no other BU course covers application development using MEAN. There are a few similar courses:

MET CS401/CS601 Web App development
The two courses examine web application design and development, however the focus is on HTML and CSS. Javascript is used to query traditional relational databases to populate dynamic HTML pages.

MET CS501 Web Technology and Languages
The course is an overview of several different approaches to web application design.

CAS CS108 Application Programming
Provides an introduction to programming concepts, relational databases, and web-site design in HTML, primarily focuses on LAMP stack (Linux, Apache, mySQL, PHP).

Course Schedule

Week	Lecture	Lab
1	Javascript overview JSON as an object model Javascript lambdas & callbacks Asynchronous programming with promises Software repositories and version control (git et al)	Asynchronous programming and function chaining
2	Node.js architecture Setting up a new MEAN application Node.js + Express routing Building configuration files Using npm and bower for dependency resolution	Creating a back-end API with Node.js
3	Relational vs non-relational databases MongoDB schemas with mongoose Internal API architecture Project checkpoint 1	Data modeling with MongoDB and Mongoose
4	Midterm exam Angular overview - architecture Angular expressions Angular controllers	Single-page applications design in Angular
5	MVC vs MVVC architectures Angular services: $http + $resource Angular routing Unit tests with Mocha and Chai	Linking front-end and back-end with Angular services
6	CSS with Bootstrap Adding interactivity with Closure Authentication strategies Deploying applications on AWS	Presentation layers with Bootstrap and Closure
7	Project presentations Final exam	