

Project 07:
**A Cognitive Training Quiz
Application**

Midpoint Presentation

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Project Description

- Create a web-based visuospatial cognitive training program
 - Has 5 modules and progressively trains participants
- Custom-designed graphics and animations supplied by the Arts as Applied to Medicine Department
- Employ user experience design and gamification to enhance the test

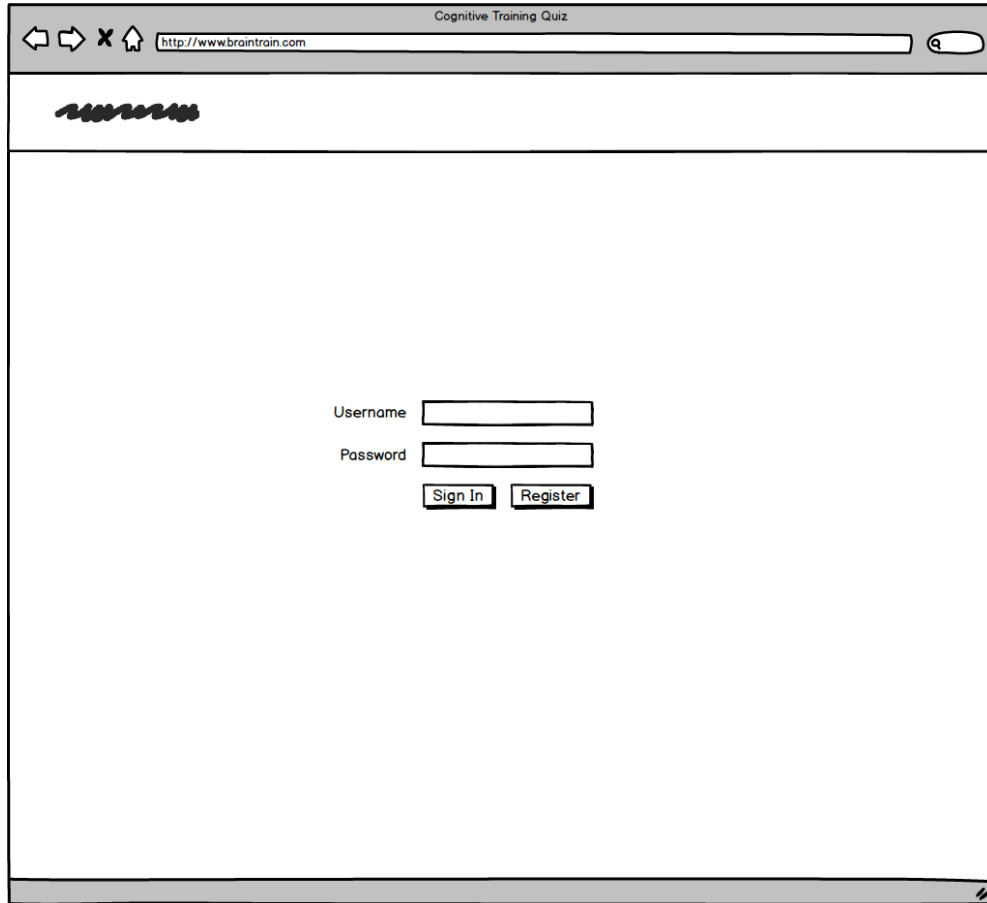
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Dependencies

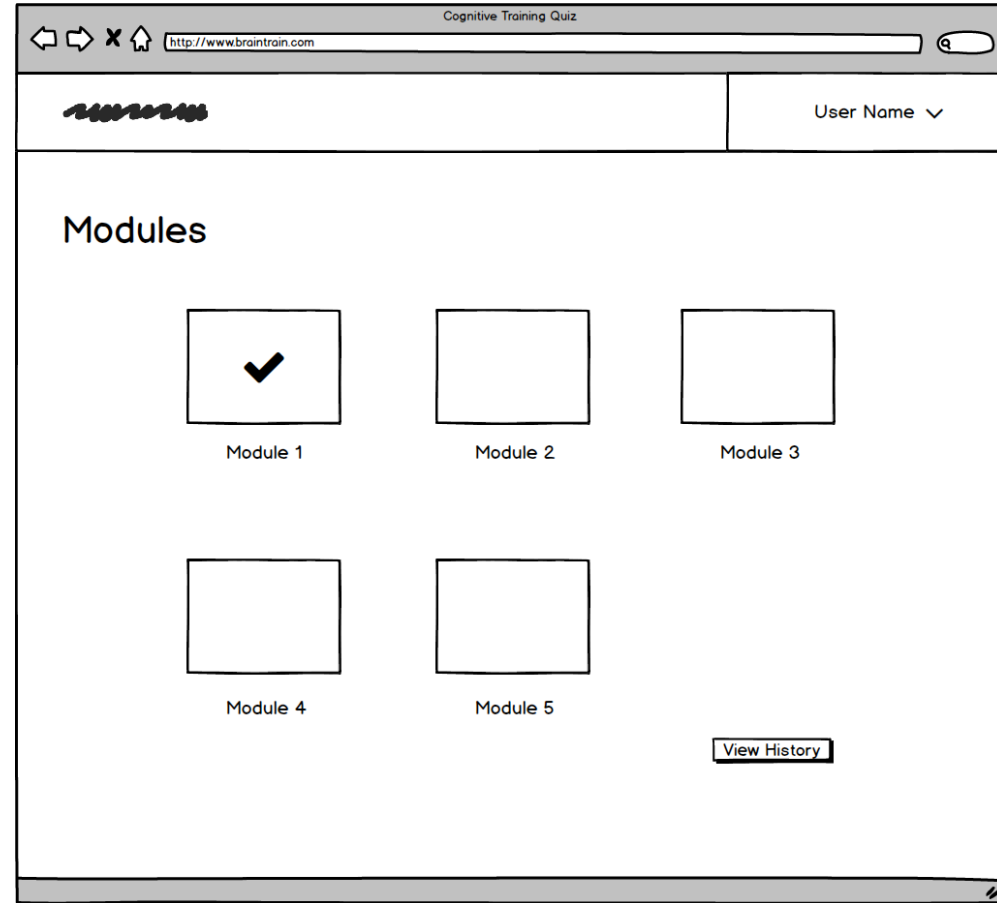
- Software dependency management: npm, bower, mvn – **Done**
- Test question illustrations – **Arts as Applied to Medicine Department**
- Stash (Git) access – **Done**
- Jira access – **Done**
- Possible deployment environment – **Done**

UI Sketches

Patient Dashboard

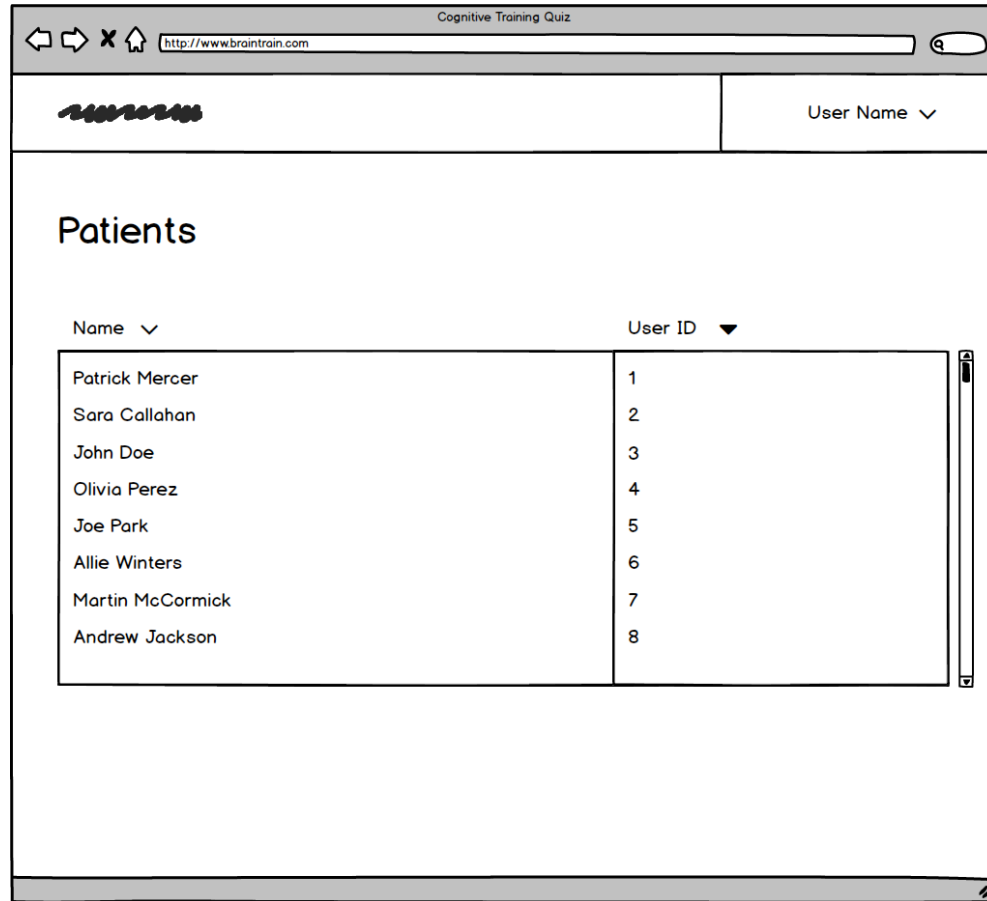


Log In Screen

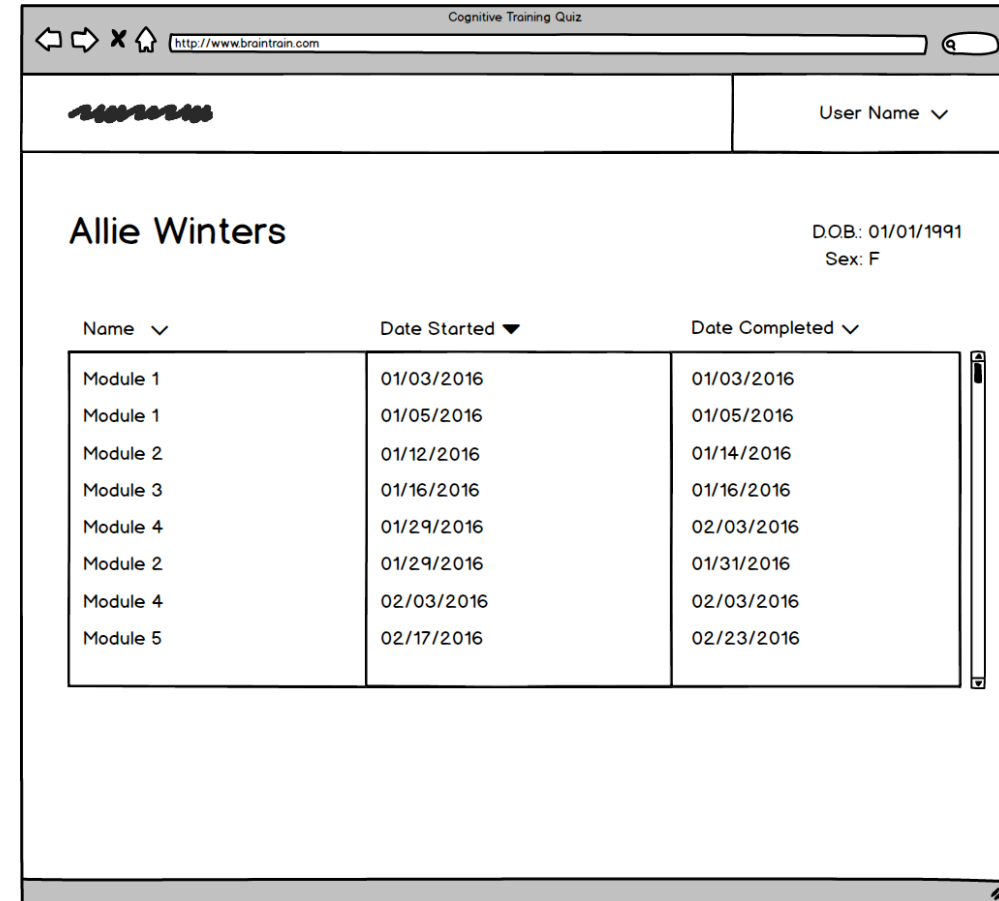


UI Sketches

Patient In-Depth

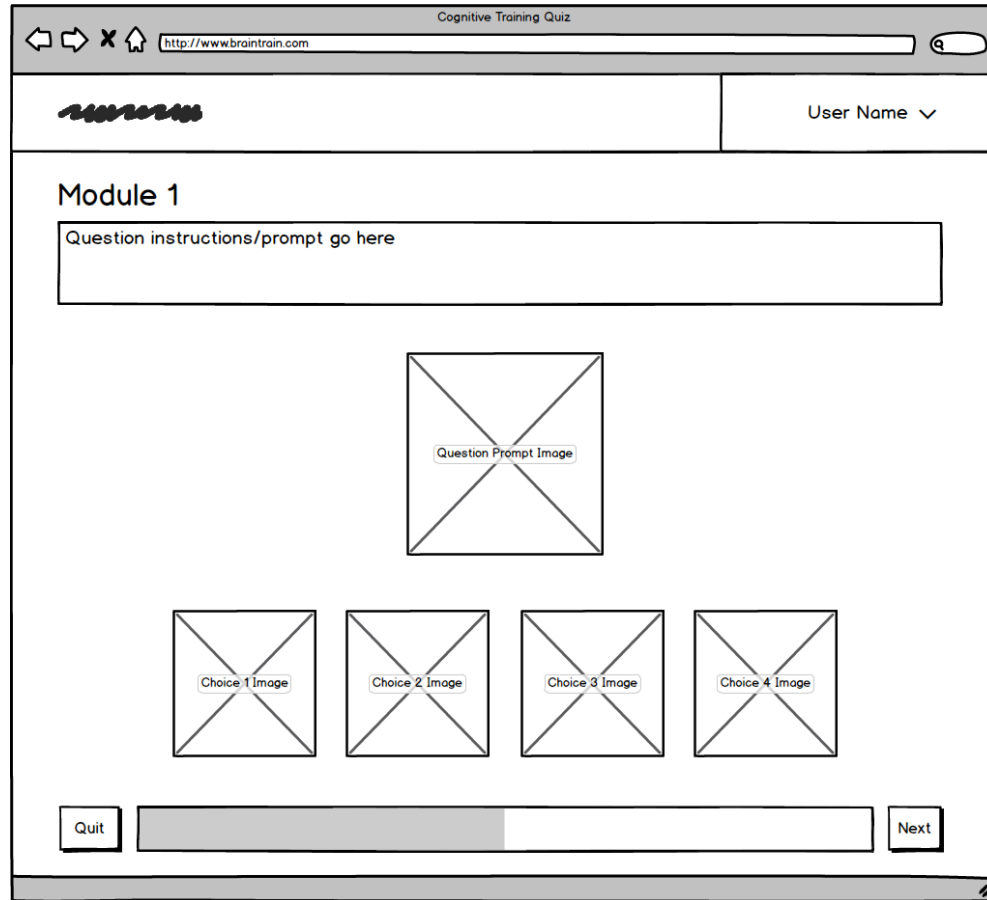


Physician Dashboard

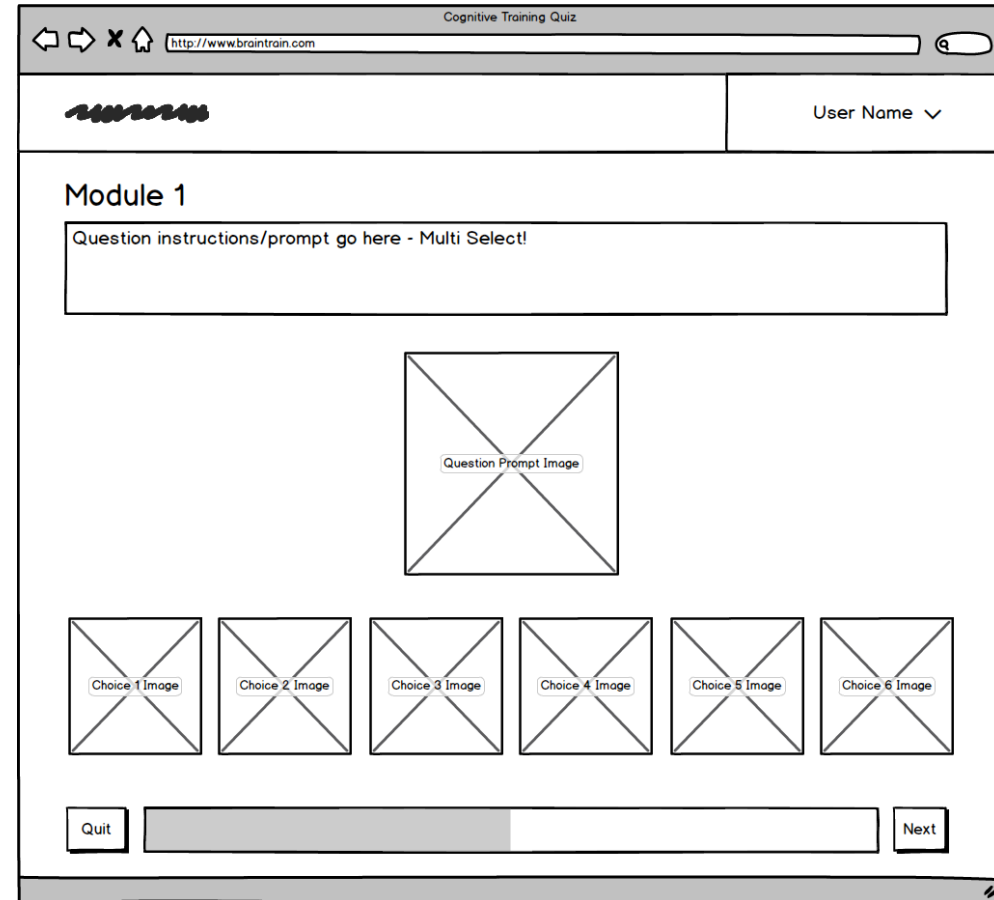


UI Sketches

Quiz – Multi-Select



Quiz – Single Select



Deliverables

- **Minimum:**
 - Design documents & UI mockup ✓
 - HIPAA-Compliant, Encrypted Database ✓
 - Serve the quiz (3 out of 5 modules) ←
 - Working barebone interface ←
- **Expected:**
 - Serve all 5 modules of the quiz
 - Store results, allow patients to view own results, allow physicians to view their patient's results
 - Polished UI ←
 - Plot performance history over time
- **Maximum:**
 - Data analytics on stored data
 - Allow for advanced queries on data
 - Conduct usability studies/pilot studies with actual patients

Demonstration

Technical/Design Challenge: Data Serialization

1-1

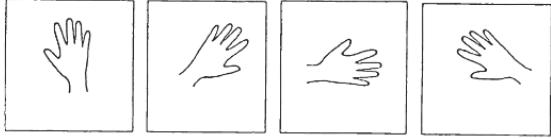
SPATIAL ABILITY

In this training program we will practice on improving our spatial ability. Spatial ability is a very important skill in our daily lives. We use our spatial ability in activities, such as "reading" a road map, in giving directions to others, and in moving about in our home or in a shopping mall. Spatial ability is also necessary for tasks, such as rearranging the furniture, assembling parts in a kit (e.g. putting together unassembled equipment, furniture), and in playing certain games (chess, checkers). Spatial ability is necessary in certain jobs, such as airline pilots, dentists, and artists. In what activities do you use spatial abilities?

One very important aspect of spatial ability is being able to visualize **mentally** spatial movements. For example, you can visualize mentally yourself moving from the kitchen to the bedroom in your home. You have a mental map of the spatial location of rooms in your home. You also can mentally visualize going from your house to the grocery store—you have a mental map. These mental maps have developed through much practice. They may be so overlearned that we are not always aware of them.

We can also develop mental images for familiar people and objects. A mental image enables us to visualize a familiar object in different spatial orientations. Look at the pictures of the hands below. In each picture **the back of the hand is shown, not the palm.**

The hands are shown at different angles. How can we determine which pictures show the back of the **right** hand and which pictures show the back of the **left** hand? We can mentally visualize the hand being rotated to a more familiar position. Which pictures show the back of the **right** hand? Which pictures show the back of the **left** hand?




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space1.txt
1 | {
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4 |     {
5 |       "type" : "intro",
6 |       "prompt_picture" : " ",
7 |       "prompt" : "<p>In this training program we will practice on improving our spatial ability. Spatial ability is a very
8 | important skill in our daily lives. We use our spatial ability in activities, such as "reading" a road map, in giving
9 | directions to others, and in moving about in our home or in a shopping mall. Spatial ability is also necessary for tasks,
10 | such as rearranging the furniture, assembling parts in a kit (e.g. putting together unassembled equipment, furniture), and
11 | in playing certain games (chess, checkers). Spatial ability is necessary in certain jobs, such as airline pilots,
12 | dentists, and artists. In what activities do you use spatial abilities? </p>
13 |
14 | <p>One very important aspect of spatial ability is being able to visualize <b>mentally</b> spatial movements. For example,
15 | you can visualize mentally yourself moving from the kitchen to the bedroom in your home. You have a mental map of the
16 | spatial location of rooms in your home. You also can mentally visualize going from your house to the grocery store—you
17 | have a mental map. These mental maps have developed through much practice. They may be so overlearned that we are not
18 | always aware of them. </p>
19 |
20 | <p>We can also develop mental images for familiar people and objects. A mental image enables us to visualize a familiar
21 | object in different spatial orientations. Look at the pictures of the hands below. In each picture <b>the back of the hand
22 | is shown, not the palm.</b></p>
23 |
24 | <p>The hands are shown at different angles. How can we determine which pictures show the back of the <b>right</b> hand and
25 | which pictures show the back of the <b>left</b> hand? We can mentally visualize the hand being rotated to a more familiar
26 | position. Which pictures show the back of the <b>right</b> hand? Which pictures show the back of the <b>left</b> hand? </p>
27 |
28 | <p><img-prompt_picture> </p>
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30 | <p>In the exercises in this session we will practice: 1) forming mental images and 2) mentally rotating images. For some
31 | of you, this may be very difficult in the beginning. You may have had little experience in doing this type of task. You
32 | may be a little "rusty", others of you may have had much experience with spatial problems. Perhaps your job involved
33 | spatial reasoning. <b>With practice most of us can improve our spatial ability.</b></p>"
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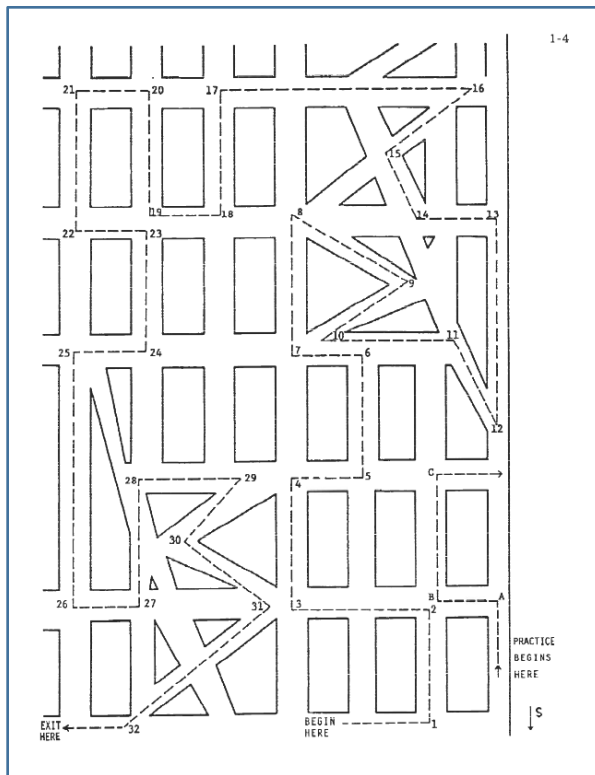
Data Serialization

- Need to transmit the data from server to client in a format that is easily consumable (REST APIs consume JSON)
- Want to serve it piecewise (no long loading delays)
- Also need to serve resources (images, etc)
- Need to devise a scheme for submission of results also

Current Solution

- Quizzes already broken up into 5 modules
- Subdivide further into training & testing
 - Components within training & testing
 - Each component is a JSON object, with a “type” field that indicates which view should be rendered: single-select, multi-select, instructions, etc.
 - Type flag indicates what other fields can be expected within the JSON object
 - Links to prompt images, additional resources, etc.

Current Solution (cont'd)



1-5

FORMING MENTAL IMAGES

There are several steps involved in solving spatial problems. The first step is to form a **mental image** of an object or drawing. A second step involves mentally rotating or turning this mental image.

In this exercise we will practice on the first step—forming mental images. Look at EXAMPLE A. Look at the picture on the left. Which picture on the right looks like the picture on the left? Yes, it is Answer C. In order to solve this type of problem, you must remember (form a mental image) of the drawing on the left. Then you must decide which drawing on the right is like this mental image. Now, circle the answer to EXAMPLE B.

EXAMPLE A

A B C D

EXAMPLE B

A B C D

The answer to EXAMPLE B is **D**.

Now work the problems on the next 5 pages. The trainer will give you **1 minute**. Do not be concerned if you cannot answer all the problems. **No one** can solve all the problems in 1 minute, but we need to know how many problems you can answer in one minute. Work as quickly and as accurately as you can.

1-16

A MEMORY EXERCISE - 1

Mentally rotating drawings to different spatial positions involves memory ability. You must be able to remember the drawing. You must be able to have in memory what the drawing looks like at different spatial positions. You will be remembering numbers, rather than drawings in this exercise.

The trainer will call out several numbers. You are to repeat the numbers in **exactly backwards** order to the order in which they were called out. For example, the trainer calls out 1, 3. You respond 3, 1.

Let's practice on 2 problems

(Trainer takes booklet)

EXAMPLE A

Trainer: 1, 4
Participant: 4, 1 R W

EXAMPLE B

Trainer: 1, 3, 5
Participant: 5, 3, 1 R W

Do you have any questions about what you are to do?

Current Solution (cont'd)

- Data for modules stored in .json file
 - Human-readable, easy to edit (while we're in the process of transcribing the quizzes)
 - Resources, including question HTML hosted from separate webserver for front-end
 - Back-end server only hosts the REST API
- ModuleProvider class parses this file on server startup, is injected as a dependency into controllers that serve module data on back-end
- Answers stored in localStorage (with cookie fallback) in browser, pushed on completion via REST API call

Possible Improvements/Considerations

- Migrate module data to the back-end database
 - Allows for modification without restarting the server
- Separation of resources and data somewhat problematic
 - Have to alter both the data on the back-end server and the resources on the front-end server to add/alter modules
 - Better if they were consolidated in one place

Introduction

Dependencies

Progress

Problems

Timetable

2016



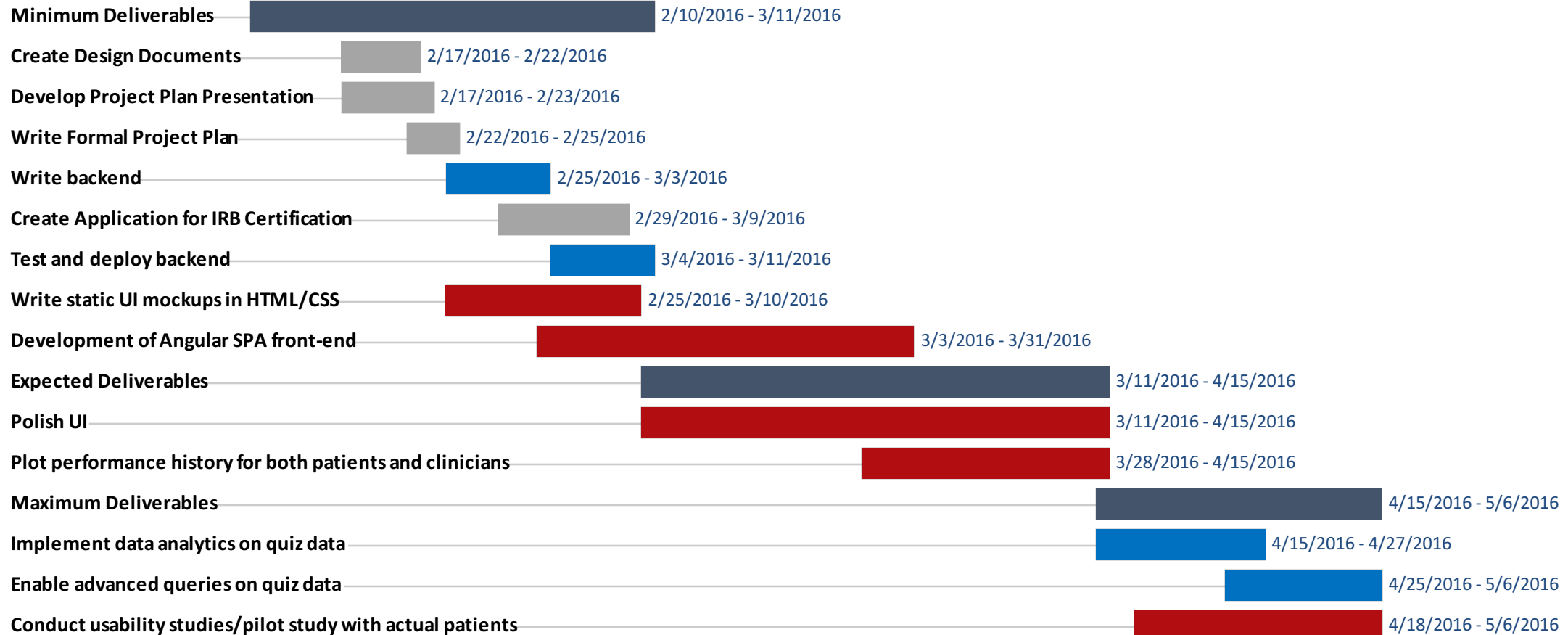
Min Deliverables
3/10/2016

Paper Seminar
4/21/2016

Expected Deliverables
4/22/2016

Maximum Deliverables
5/6/2016
Final Poster Session
5/6/2016

Today



Introduction

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2016



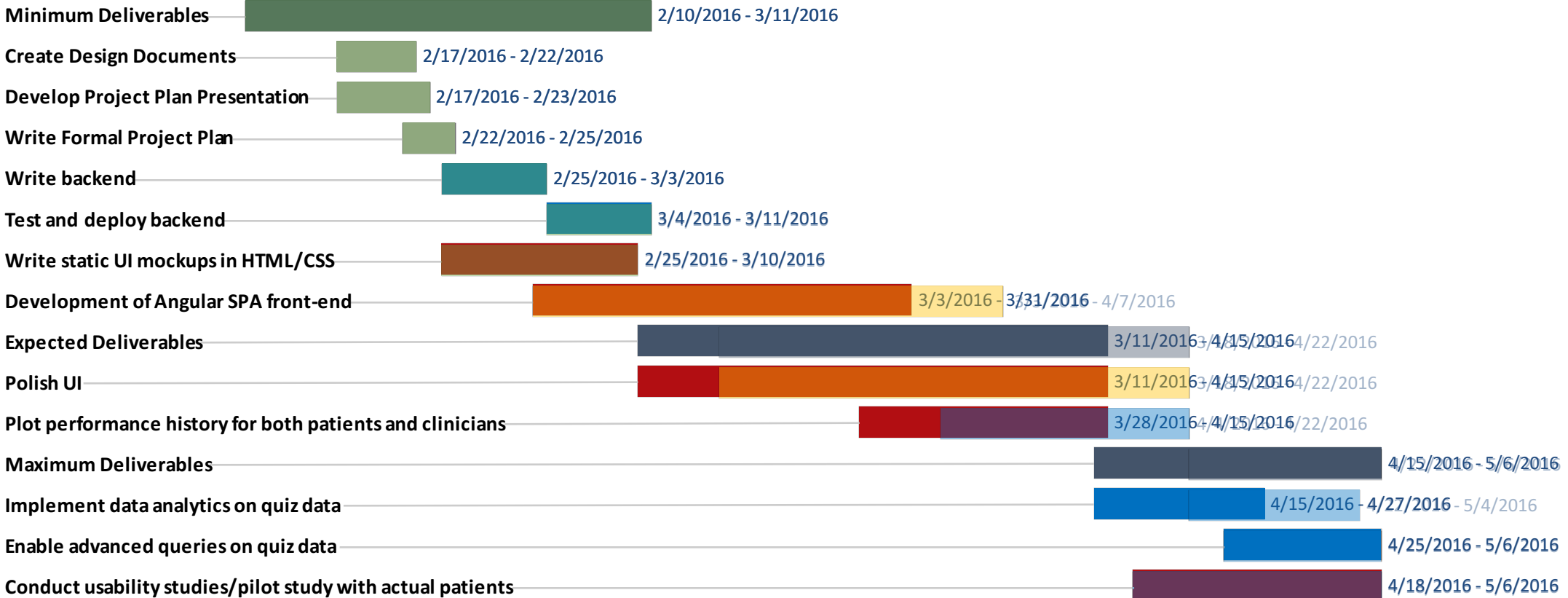
Min Deliverables
3/10/2016

Paper Seminar
4/21/2016

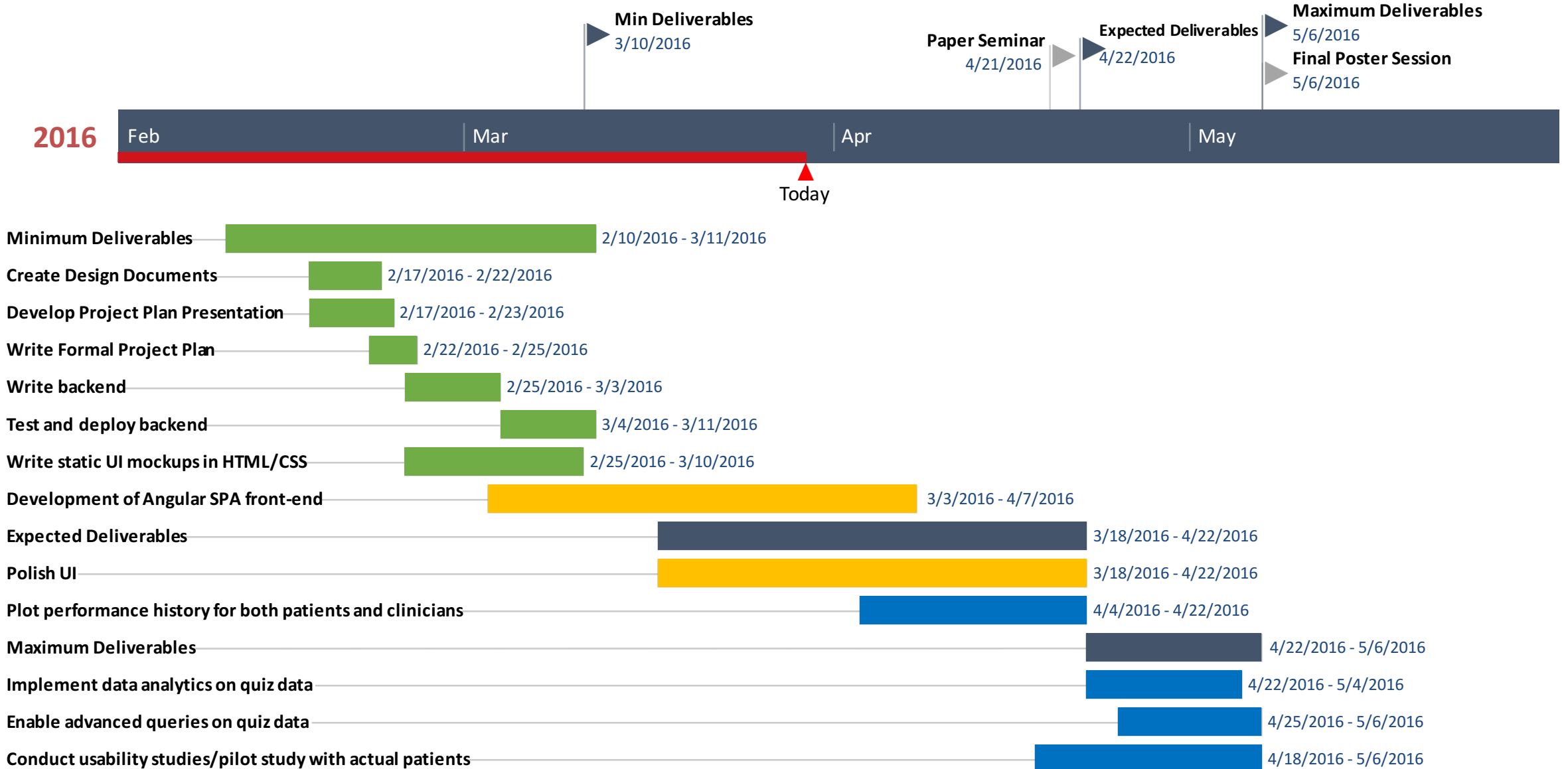
Expected Deliverables
4/22/2016

Maximum Deliverables
5/6/2016
Final Poster Session
5/6/2016

Today



2016



Questions?