Applications of Computer Science

CDA Team
Dan Blanchette
Taylor Martin
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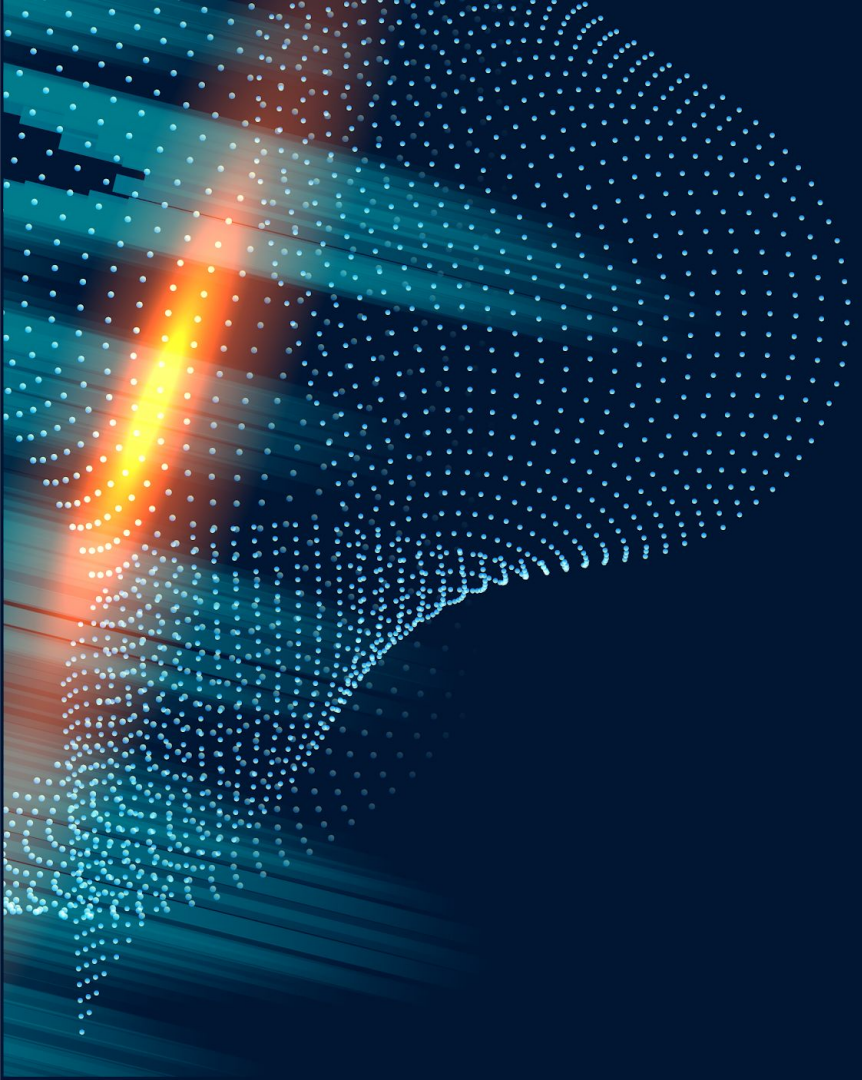

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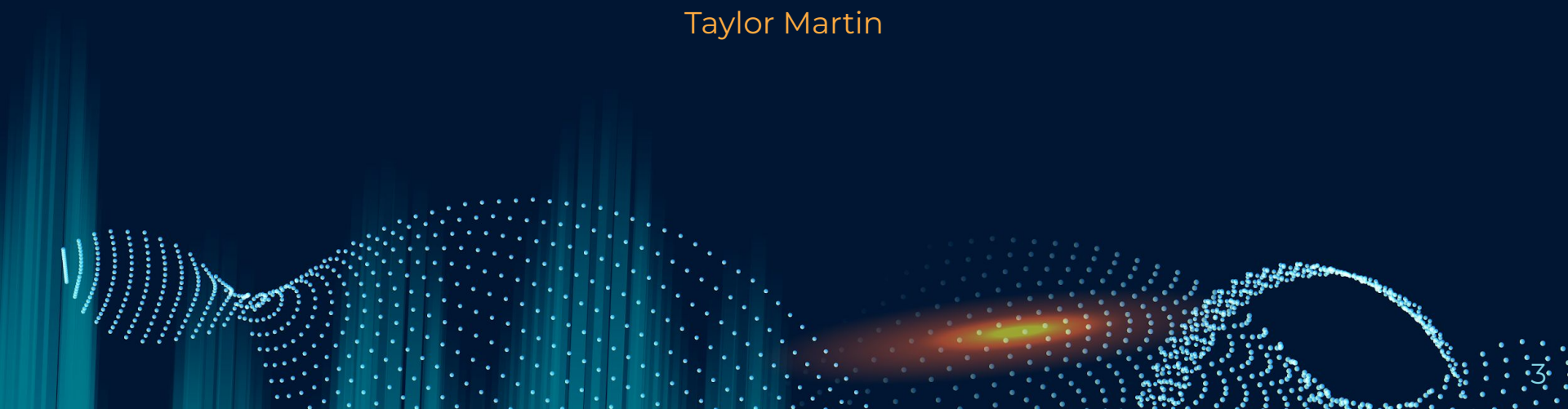
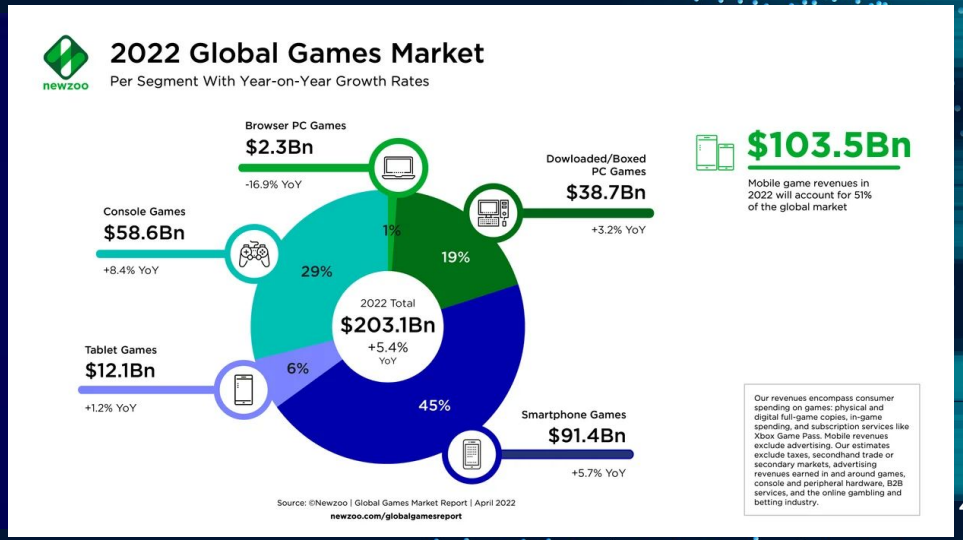
Gaming Industry

Taylor Martin



The Gaming Industry:

- One of the numerous computer science fields that you may choose to go into after graduation is the gaming industry.
- You have the ability to create and build fun things that bring people enjoyment and feel a range of emotions.
- The gaming industry is a ever growing industry, and still is just in the early stages global market influence.



Polymorphic Games!

- I had the amazing opportunity to work with Polymorphic Games over Summer 2022.
- Polymorphic Games is an evolutionary video game studio at the University of Idaho.
- Polymorphic Games Studio is made up of undergraduate students from departments including Computer Science, Art, English, Music, Business, and Biology who are building video games.
- The Polymorphic Games Studio functions similarly to a co-op program or research lab where undergraduate students are hired for summer positions to assist in game development.

Polymorphic Games & Software Engineering

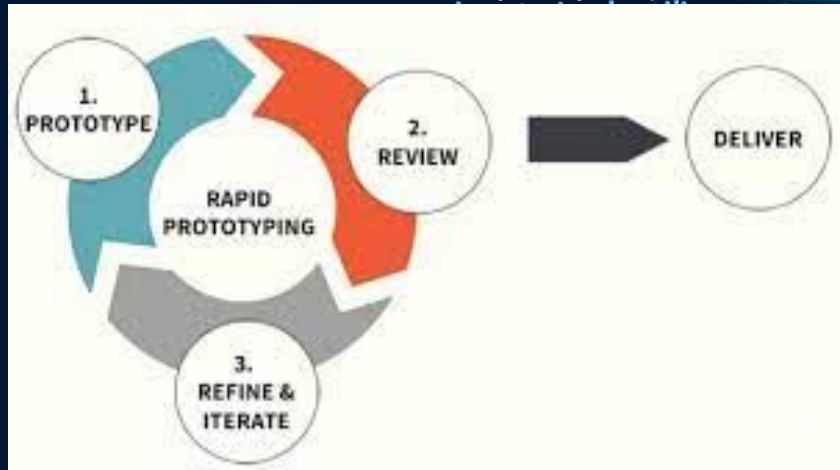
While working with polymorphic games as a game developer, there were numerous applications of material from this class:

- At the start of the project we drafted a project timeline Gantt Chart.
  - We would update this daily with work completed and future work needed.
  - Tasks would be labeled and color coded based on priority
  - There would be tasks that have predecessor tasks as well.
  - We had a budget to follow.
- The CS members of the development team had to draft a coding standards template.
  - We made sure to follow this template closely to maintain Uniform, Readable, and Writable code.
  - We made a lot of documentation
    - Code comments
    - Work logs
    - Bug log
- Design Patterns:
  - Utilized Singleton
  - Utilized Decorator
- Created an M.V.P
  - Minimum Viable Product

Game Development & Rapid Prototyping

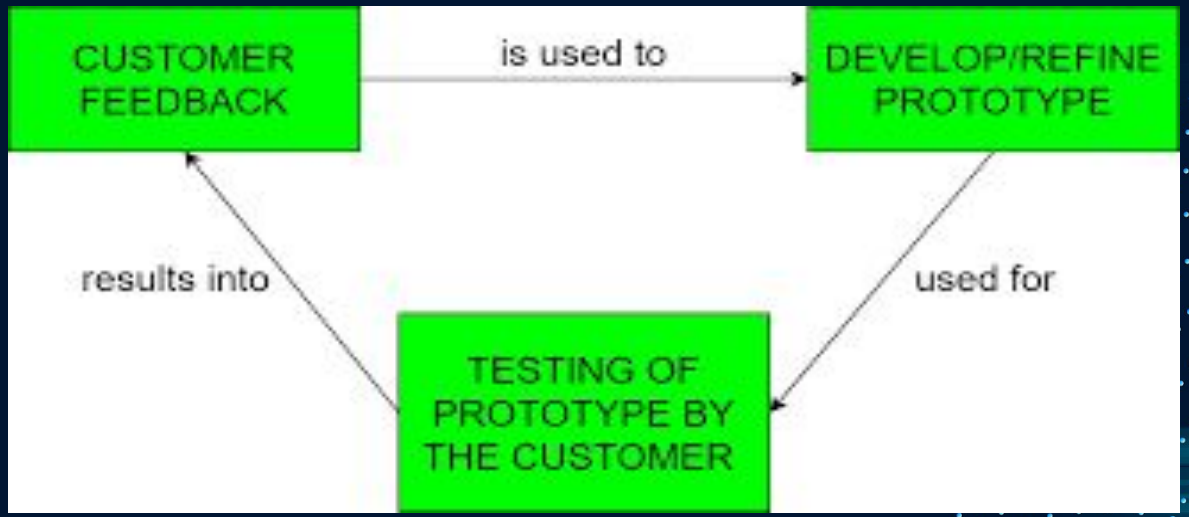
One of the main concepts that we used on our development team not mentioned in the previous slide is Rapid Prototyping!!!!

- What is Rapid Prototyping?
  - Rapid prototyping creates product simulations for testing and validation during the product development process.
  - Multiple iterations generated during a short period based on user feedback and analysis.
- They’re simple and very powerful. Three main steps:
  - Prototype
  - Review
  - Refine & Iterate



Game Development & Rapid Prototyping

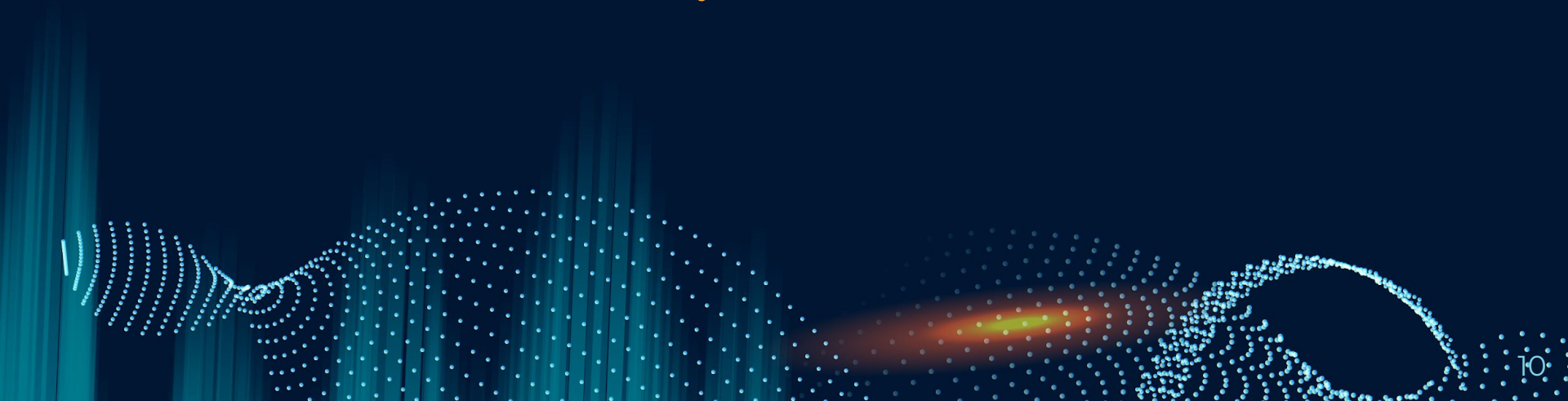
- You can organize your ideas clearly to convey them to people that don't speak computer!
- The development team came up with several prototypes using rapid prototyping.



Questions?

Internet of Things

Project VineHeart



What is IoT

Simple definition: Network of physical objects, or “things”

How this is accomplished: embedded sensors!

So many things use IoT

- Household appliances
- Garden monitors
- Smart watches
- Fleet monitoring in trucks
- Manufacturing

Components of IoT

Collect

Capture data and modify it using computers

Transport

Move data between computers and database

Store

Store data locally and in the cloud

Present

Present data to client in a readable format

Project VineHeart

Smart vineyard system

- When and where to plant based on sensor readings to optimize wine production

My job? Prototyping!

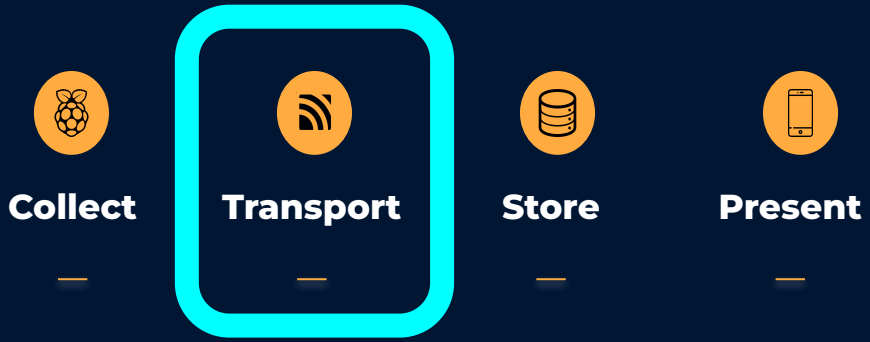
- Prototyping again? Why is it so important?
- Communicate in an easy way what your client can expect

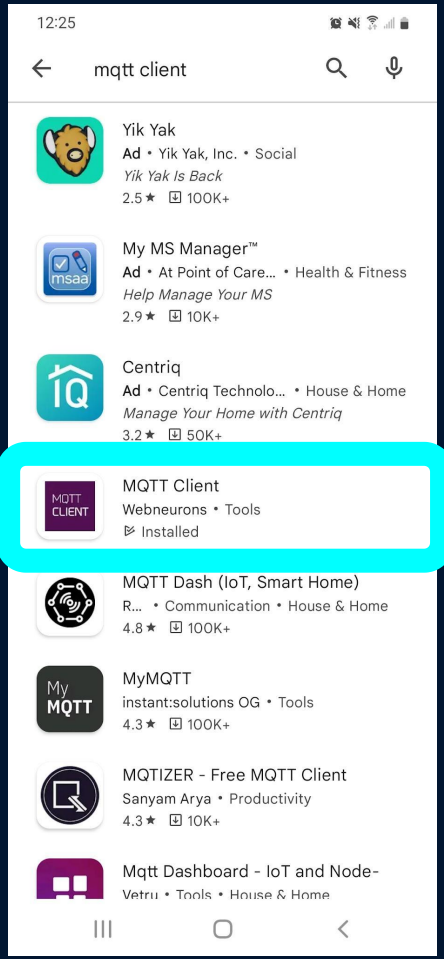
Client expectations

- Gantt charts
- RFP/Proposals

DEMO!

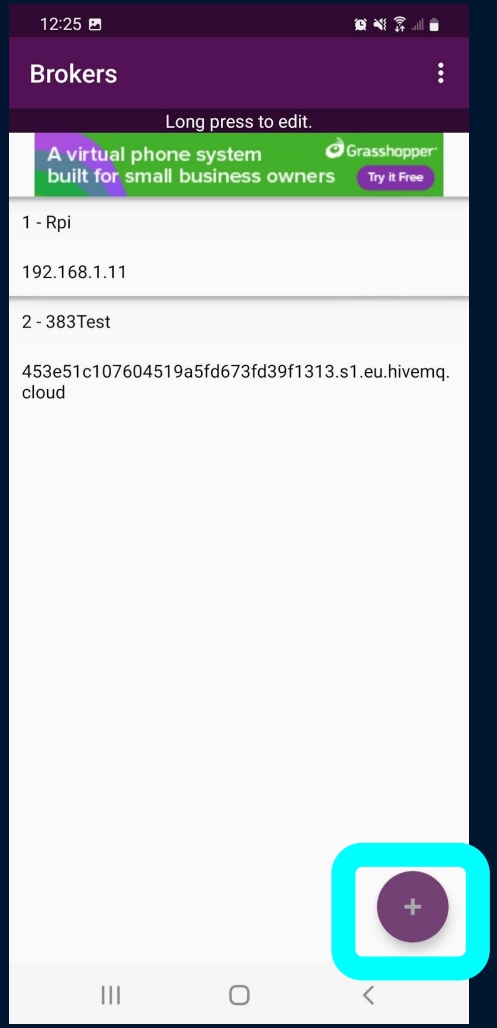
Let’s try out MQTT!



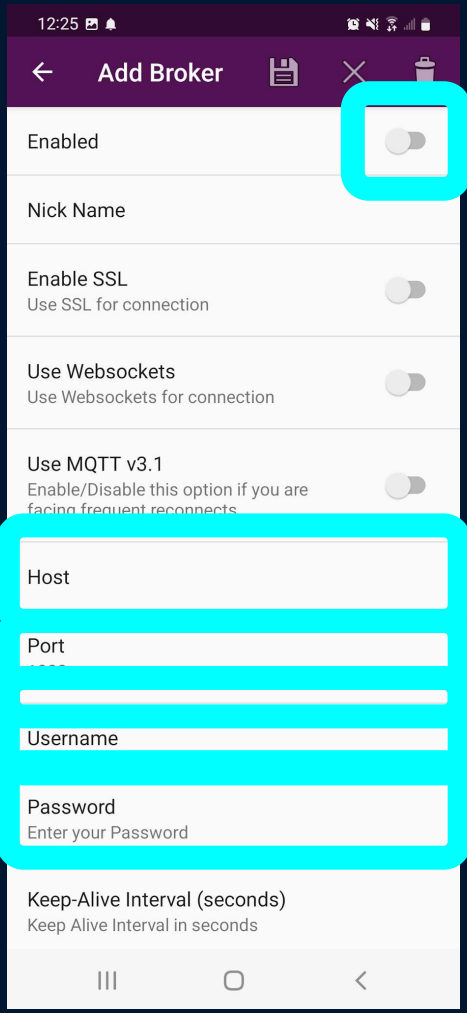


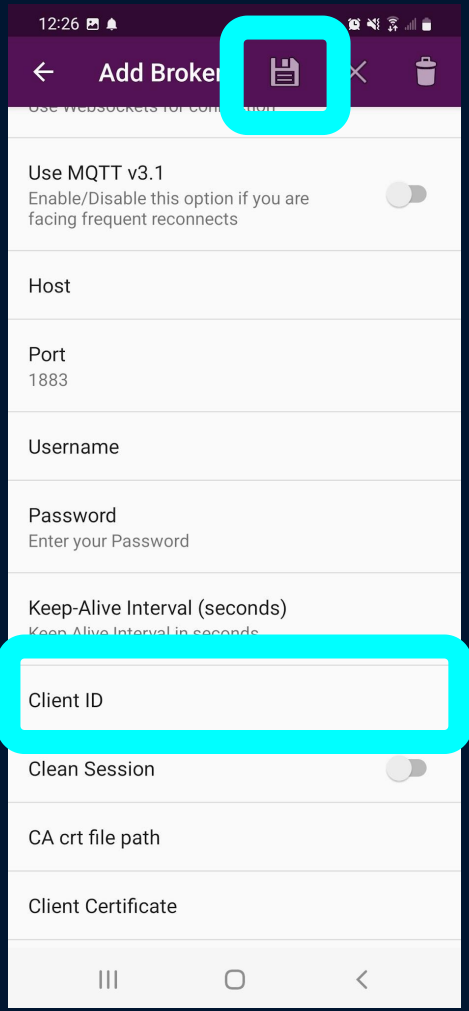
Download MQTT Client

EasyMQTT for iPhone



Add new server





Add details

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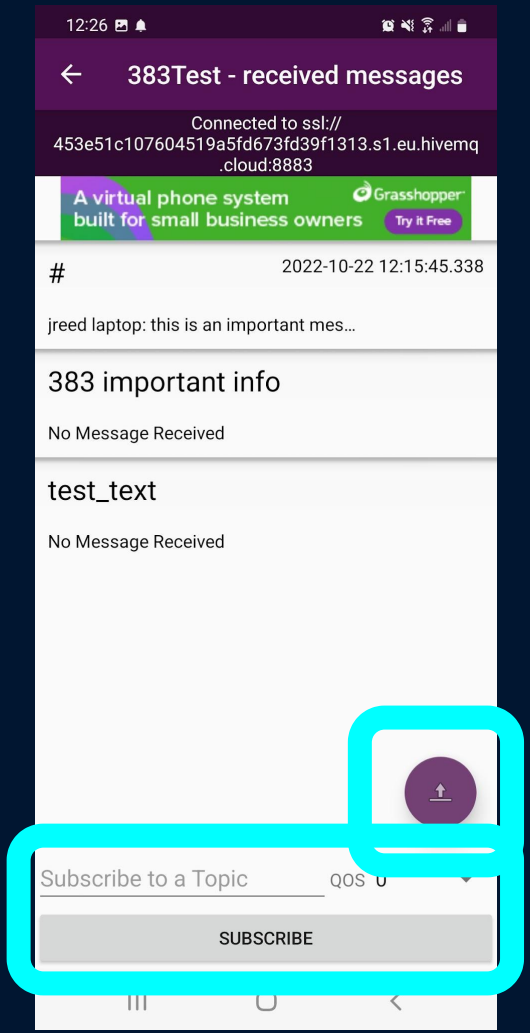
Port: 8883

Username: student

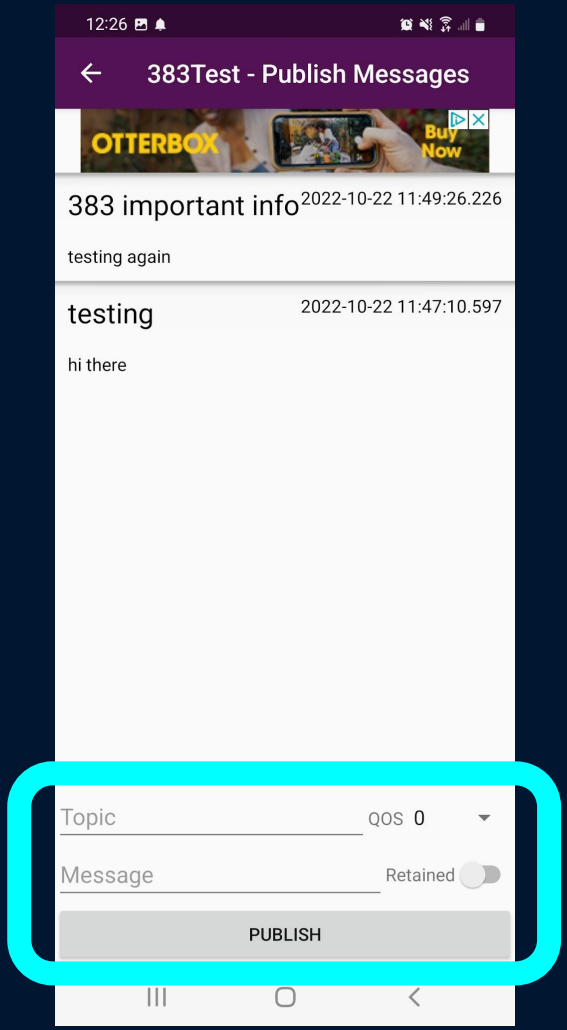
Password: cs383_students

Client ID: first initial and last name



Subscribe to Topic

383 info



Publish Message

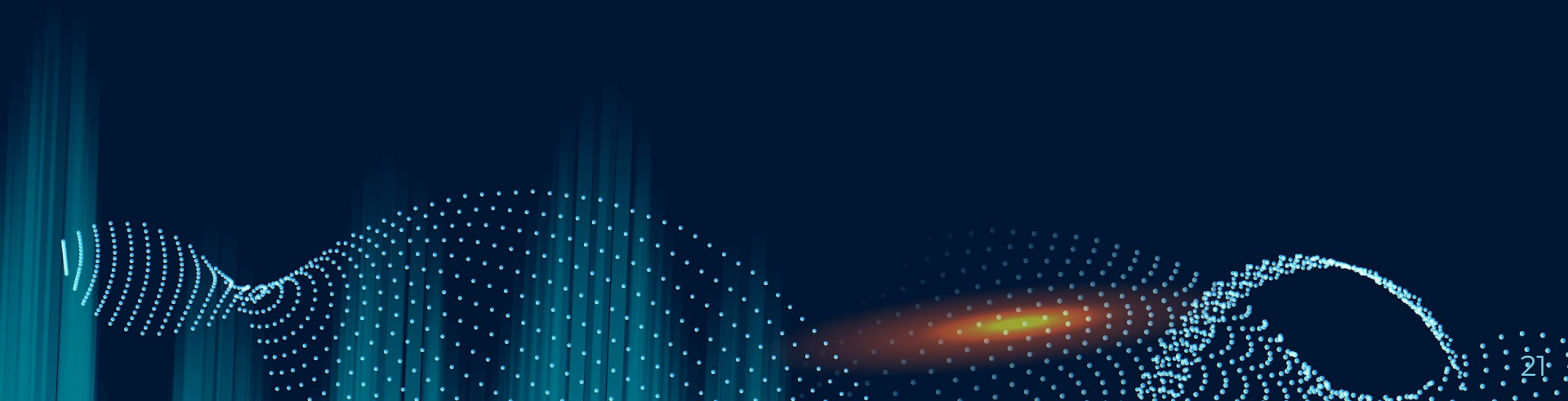
Topic: 383 info

Message: [something]

Questions?

Biomedical Research

Dan Blanchette



Software Engineering: Bioinformatics & Biomedical Research

Questions:

1. **What is informatics?**
2. **How do Informaticists help other fields with their research?**

Answers:

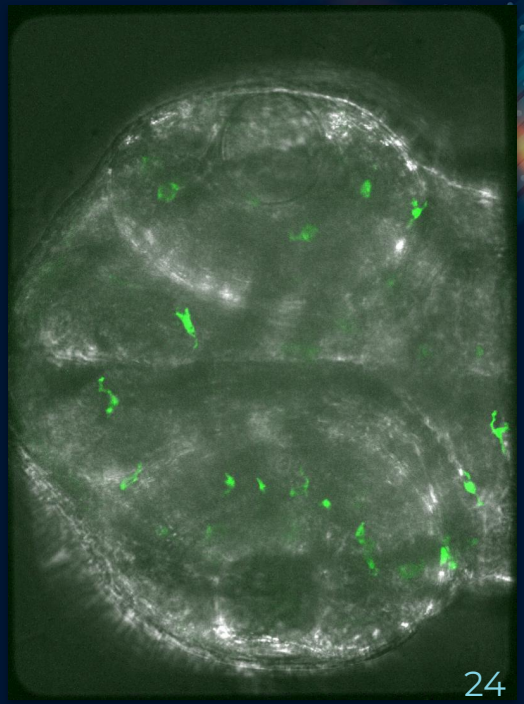
1. **Informatics is a field in which computer scientists take large amounts of data and transforms the output into other formats for improved interpretation. (graphical, digital images, user interfaces, etc)**
2. **The goal is to make the information accessible to other fields and help them improve the time it takes to interpret results.**

Biomedical Fellowship Idaho: INBRE

- What is INBRE?
  - A ten week biomedical undergraduate internship
  - INBRE is a network of states with universities that are funded by The National Institute of Health and Human Services for undergraduate biomedical research.
  - STEM fields involved: Chemistry, Biology, Premed, and Computer Science (Bioinformatics), Environmental Science, and Bio/Chemical Engineering.
  - Internship ends with a formal conference and presentation of student projects.
- Types of past computer science projects
  - G.I.S. analysis of wildfire affected areas.
  - Machine learning analysis in cancer cell imaging.
  - Cell identification and tracking software (Automation & Computer Vision).
  - Unreal engine development of scale model animal specimen rentinas.

My Project: Segmentation of Microglia Cells in Zebrafish Imaging.

- Tools used
  - Linux
  - Lucid Chart
  - Python (Sci-Kit, Matplot, Plotly)
  - Pixel Neighborhood Algorithm
  - Spyder IDE (For data science)
  - 488 nm laser (Research Lab's Processing)
  - Confocal Microscope (Lab Used for Recording .avi Format)
- Project Goals:
  - Create program that:
    - Converts video files to still images.
    - Accurately counts microglia cells.
    - Allows for a user calibration routine.
    - Tracks the cell's path.
    - Calculates the cell's velocity.



Why Are Researchers at U of I Interested in Zebrafish???

- Zebrafish are small in size (4–5 cm or 1.6 – 2.0 in)
- They breed quickly
- Possess a unique mutation within their retinal microglia cells that regenerates damaged cells.

Micro-Whaaaaa????

- You can think of microglia as the custodians of our neurological and optical systems. (brain and eyes)
- They consume dead cells (plaque) from neural synapses (in the brain) as well as eye tissue.

Skills That Would Have Been Helpful from This Course

- Diagrams
  - Use Cases
  - Diagram 0
  - Sequence

- Scheduling (Imperative for remote work)
  - Project Goals.
  - Week-To-Week (GANTT).

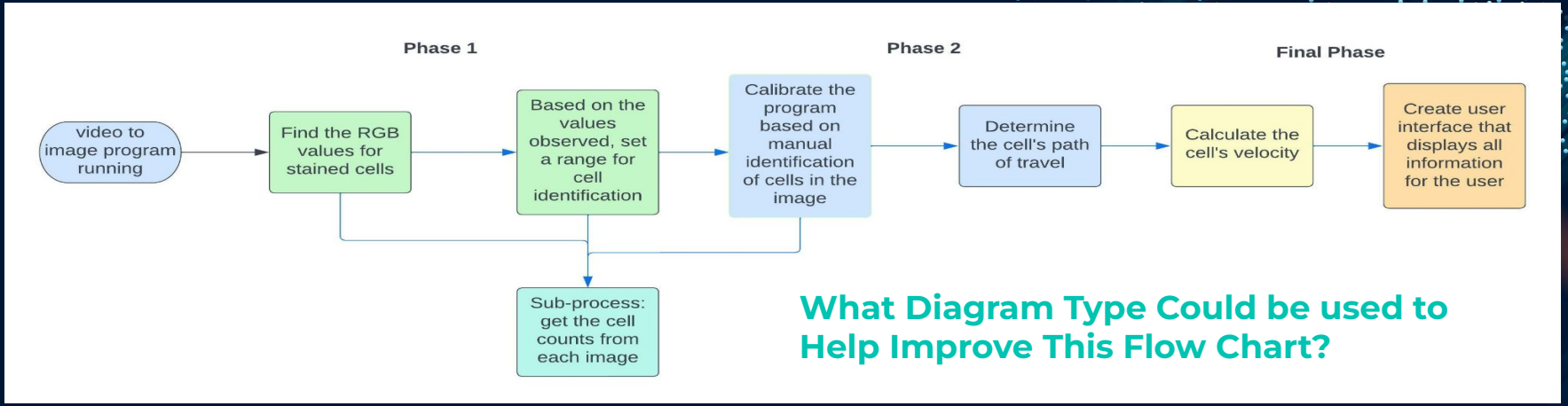
- Experience with written documentation
  - Documenting program functionality.

Why is This Important??

1. Communicating computer science to others in different STEM fields.

2. Presenting your progress with a professional investigator/mentor.

Example Diagrams



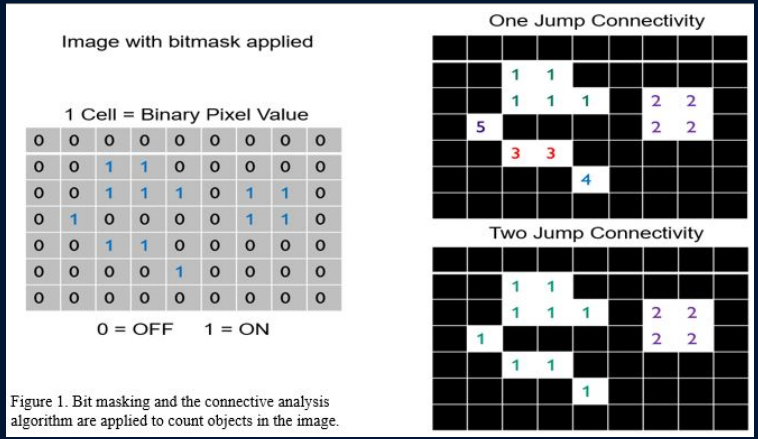
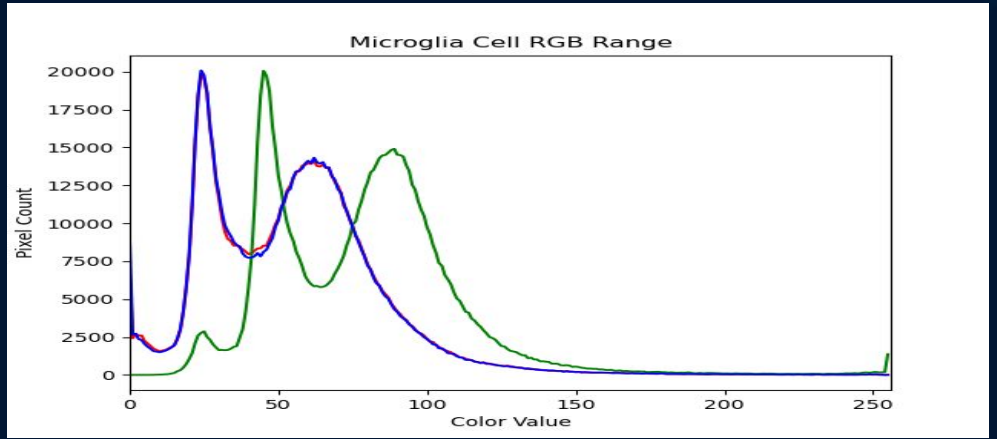
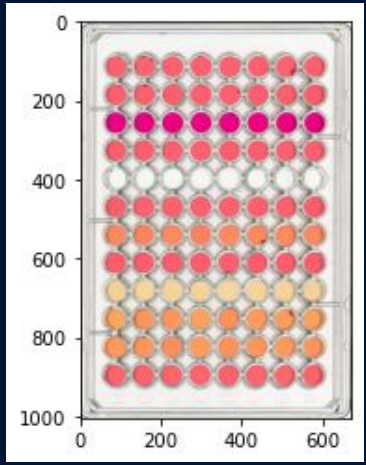
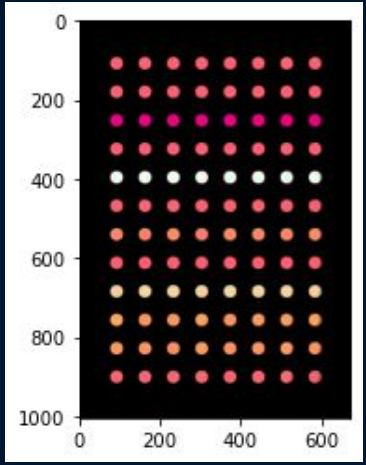


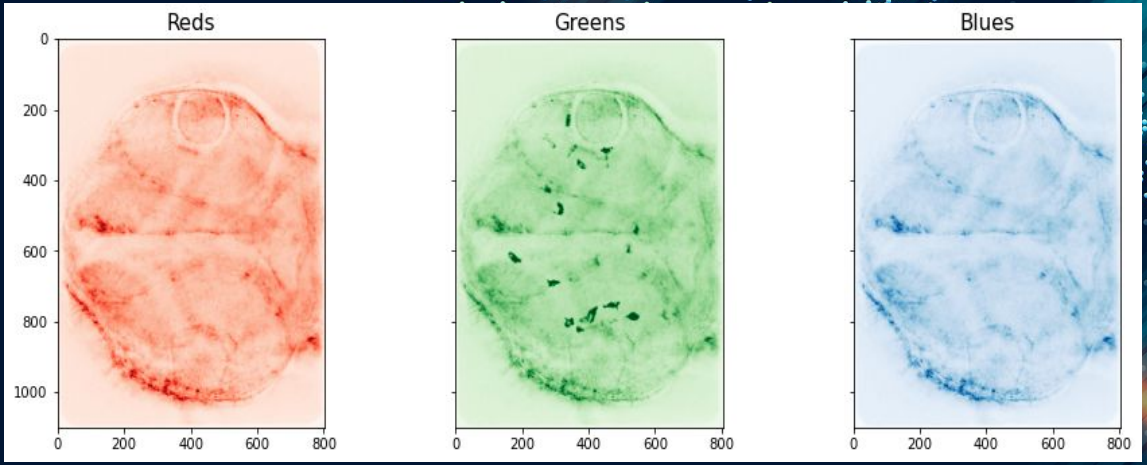
Figure 1. Bit masking and the connective analysis algorithm are applied to count objects in the image.

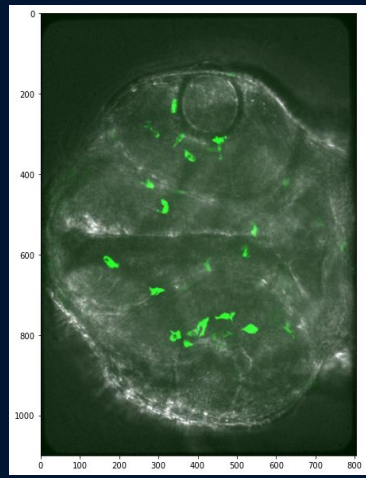


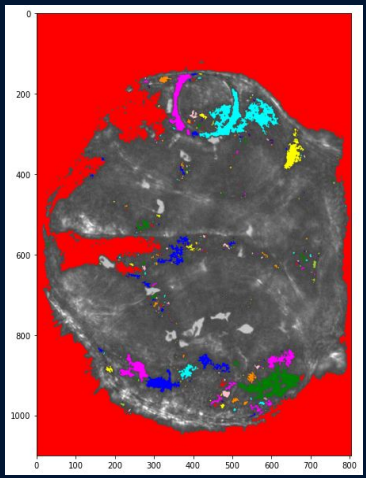
Rapid Prototyping Process

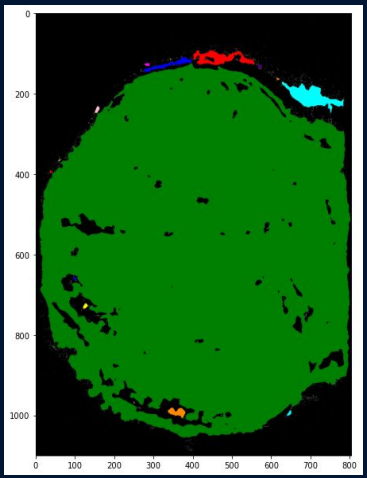


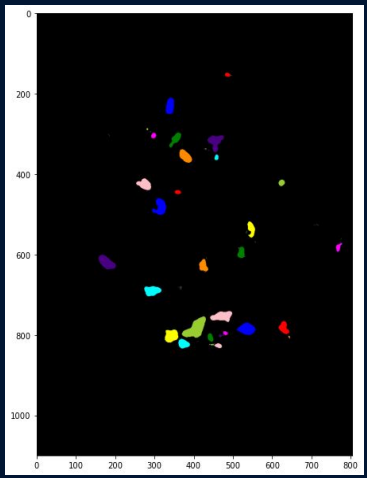












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There are 24 cells in ../pngimgs/4.png
There are 27 cells in ../pngimgs/5.png
There are 27 cells in ../pngimgs/6.png
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There are 20 cells in ../pngimgs/9.png
There are 25 cells in ../pngimgs/10.png
There are 22 cells in ../pngimgs/11.png
There are 21 cells in ../pngimgs/12.png
There are 18 cells in ../pngimgs/13.png
There are 23 cells in ../pngimgs/14.png
```

Demo of Counter Cell Prototype

Cell Counter Demo Run

QUESTIONS?

Deadlines Coming Up

10/27 - Thursday

- TL 4 update
  - What has your team done this past week
  - What will your team be doing this next week
  - Any roadblocks?
  - Gantt Chart

11/14 - Oral Exams (3 weeks)

- Individually code complete!
- Prework done on canvas
- Need to have:
  - Gantt Chart
  - Full test plan
  - Readme for prefab
  - Dynamic binding
  - Copyright violation
  - 2 patterns

THANKS!

More questions?
Ask 513 Studios

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