

This is a brief summarization for some of the projects I've been working on!

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## Personal Projects

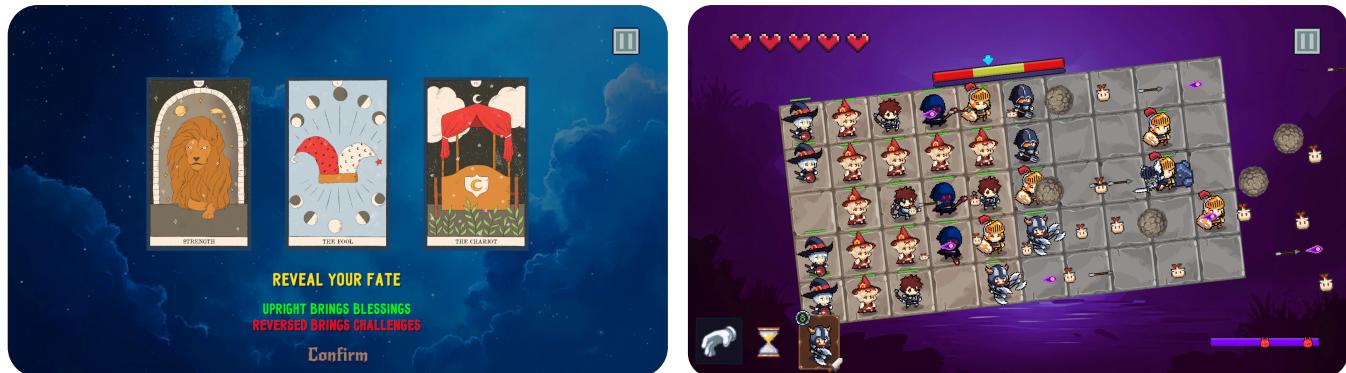
### Gravitas: A 2D Tower Defense Indie Game

Language C# Tool Unity IDE Visual Studio Download at itch.io

- An indie game for the VGDC game jam @ UCSD, in a great team of 2 programmers and 1 writer.
- Featured a **gravity-based battlefield**, where units have weights that influences the land's balance.
- Units and projectiles now affected by gravity, leading to a more fun and strategic tower defense experience.

Act as a saviour to save the world of magic, restoring the balance between light and darkness.  
Summon all heroes from the ancient past to fight against the wicked enemies.





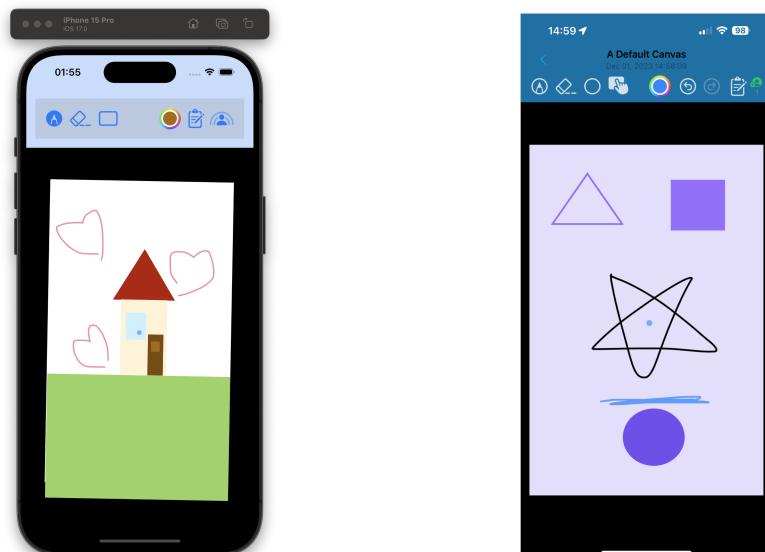
- (And...I also contributed to some Easter egg's art assets!)



## Shared Canvas: An In-person Collaboration App on iOS/iPadOS

Language Swift IDE Xcode SwiftUI Swift Data Multi Peer

- Focused on small groups of in-person meetings.
- Consists of Canvas List view, Connection view, Canvas view, and various pop-ups for canvas settings, color picker, and scribble / eraser / shape tool customizations.
- Share current canvas with nearby people, or join nearby sessions.
- Utilized **Multi-Peer Framework** for canvas hosting / data synchronization between endpoints.
- Leveraged **Codable** data structure to persist and transfer canvases using **JSON** or **Swift Data**.

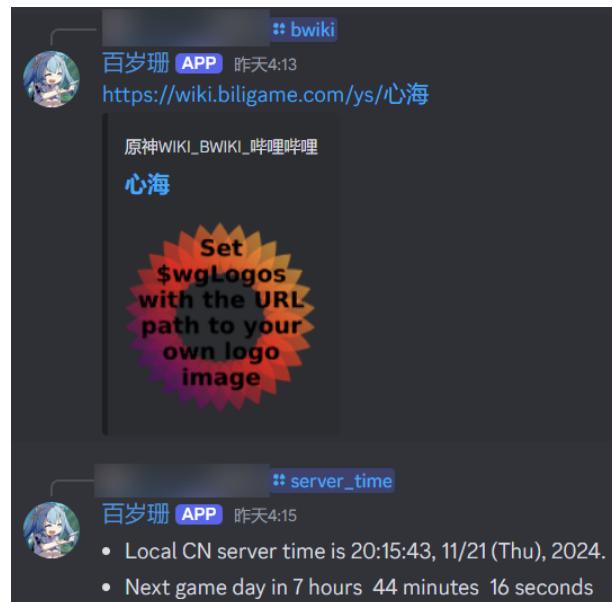


Prototype (Left) and Running on a real device (Right)

## Faruzan Senpai: A Discord Bot for My Private Server

Language JavaScript 🐧 Library Discord.js Cloud AWS

- A Discord Bot for my private server need (messages are in zh\_CN, but multilingual support is planned), such as:
  - User's daily luck
  - Game server time getter
  - Slash Command stats
  - Basic game Wiki inquiry
  - ...
- Was once hosted on Repl.it with its built-in database and stayed alive by up-timer services.
- (WIP) Migrate to AWS with a local relational database.



Some working command responses

## MC Marketplace: Prototype of a Game Item Marketplace on Ethereum

Language JavaScript 🗃 Language Solidity Tool VS Code 🎨 Framework Next.js 🏛 Library Web3.js  
 💄 Styling Tailwind CSS 🪂 Ethereum 🪂 Sepolia 🪂 Platform Alchemy

- Designed a smart contract which later deployed on Ethereum's Test Network.
- Implemented a simple front end for the marketplace with connection to MetaMask wallet and ABI's of the smart contract.
- Validated real-world blockchain connection and trades on Sepolia Test Network through Alchemy.

**MC PROPERTY MARKETPLACE**

Address: [REDACTED]

Balance: 0.417092957266925333

Add Item My Inventory Marketplace My Sale Bought

Marketplace

**View Marketplace**

- ID: 1 Name: 1st item! Type: territory Desc: Jai Price: 1 Seller: [REDACTED] **Buy**
- ID: 3 Name: 3rd Type: loot Desc: 3! Price: 333 Seller: [REDACTED] **Buy**
- ID: 4 Name: 4 Type: loot Desc: Jhin Price: 4444 Seller: [REDACTED]

**Connect Wallet**

Marketplace with test items

**MC PROPERTY MARKETPLACE**

Address: [REDACTED]

Balance: 0.495592509987658694

Add Item My Inventory Marketplace My Sale Bought

My Inventory

**Get Inventory**

- ID: 5 Name: expensive? Type: territory Desc: idk Price: 999999999999 **Put On Sale**
- ID: 8 Name: Eighth Type: territory Desc: 8848 Price: 8848 **Take Off Sale**
- ID: 9 Name: 9s Type: collectible Desc: Nine...s Price: 95213 **Take Off Sale**
- ID: 10 Name: Make it a ten Type: loot Desc: 10! Price: 10 **Take Off Sale**

**Connect Wallet**

Successfully taken Item #9 off sale!

Inventory with item status &amp; Putting Item #9 off sale

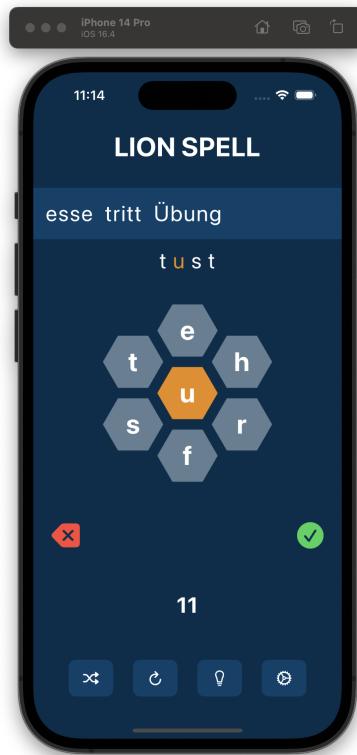
## iOS/iPadOS mini Apps



- A set of iOS Apps that practices my skill. Mostly based on SwiftUI and MVVM principle, with some UIKit and MapKit hacks.

### 1. Spelling Challenge

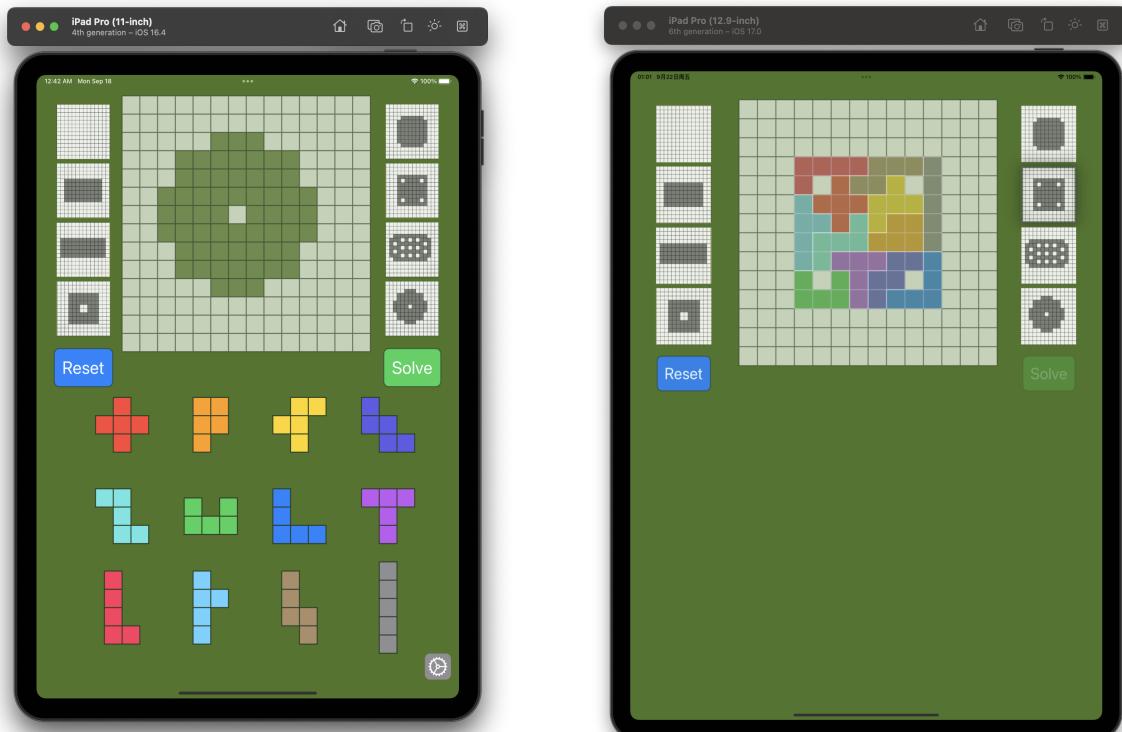
- A **word-spelling game** for 3 languages (`en_US`, `fr_FR`, `de_DE`).
- Support 5~7 candidate characters (with bonus and in different layouts), history, shuffle, hint, and restart.
- Beautiful UI in both light & dark mode.



Solving a 7-char game in dark mode

## 2. Pentominoes

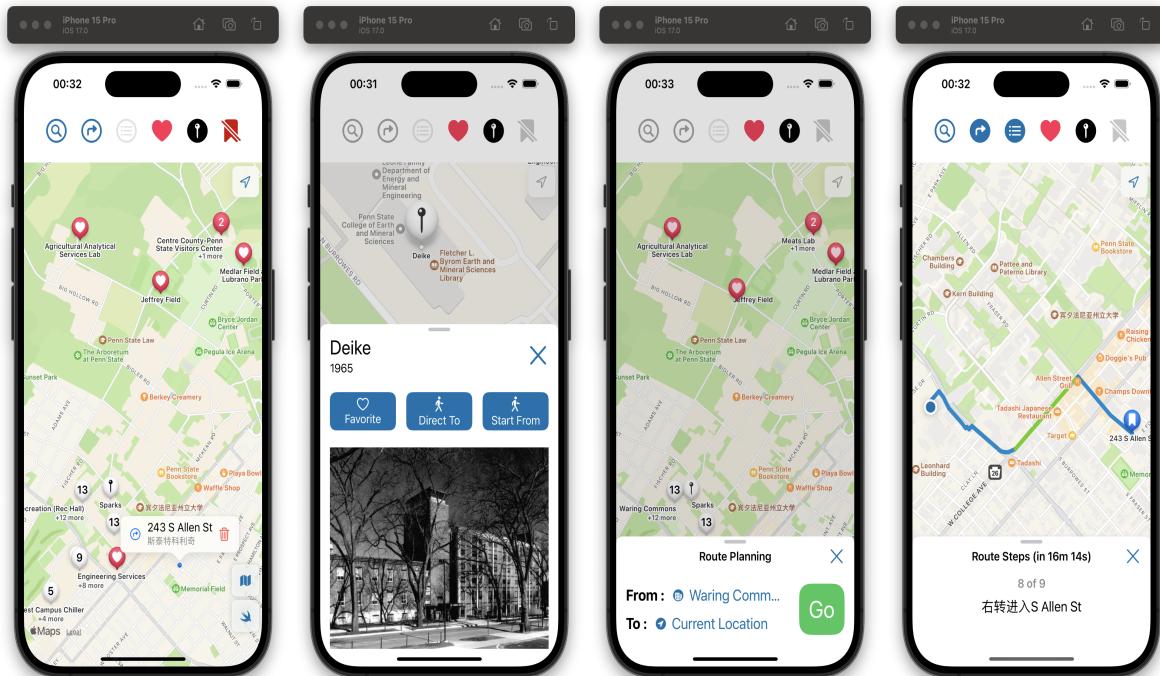
- A **puzzle game** in which player needs to form different patterns using all pentominoes.
- Support reset and auto-solve.
- Fluent and beautiful animations based on gesture and piece status.



Before and after solved (simulated on 11' and 12.9' iPad Pro)

### 3. Campus Map

- A **campus map** with data of all on-campus buildings.
- Support favorites, search, filter, data persistence across launches, pins and pop-ups, and step-by-step routing between 2 buildings or from / to current location.



Map overview; Building detail and buttons; Route planning; and Step-by-step routing.

### 4. Pokédex

- A **Pokémon collection** with attribute inquiry, ancestor and successor, and “captured” labels.
- Dynamically render transition color, index, and status in both List and Detail Views.



Home screen; Detail View; List of Fire Pokémons; "Our favorite!"; Ancestor and successor.

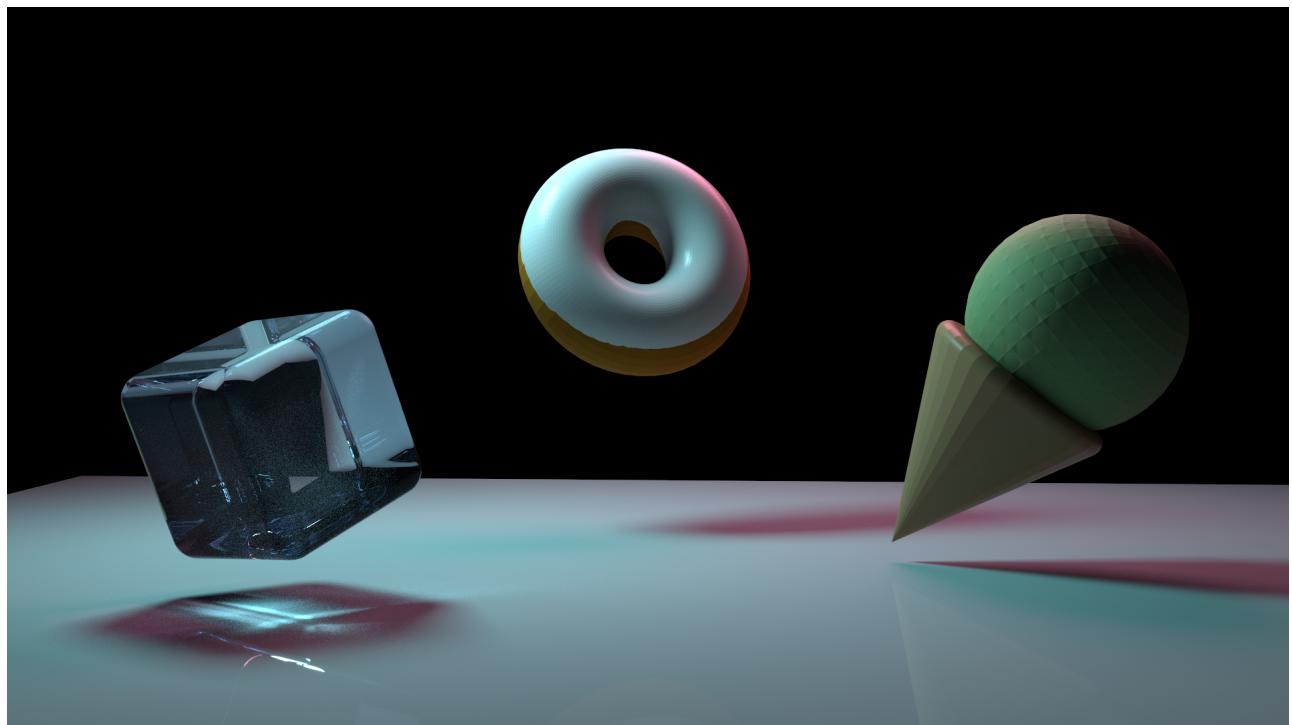
## Minecraft Mod Localizations

- Localized a bunch of Minecraft Fabric Mods.
- Report bugs & submit PR's while examining mod logics (for better translation and writing Wiki).

## Courseworks

### [Disney BSDF for La Jolla Renderer](#)

- Utilized C++ `std::variant` pattern to implement Disney BSDF materials in *La Jolla* renderer:
  1. Diffuse with subsurface
  2. Metal
  3. Clearcoat
  4. Glass
  5. Sheen
- Converted a general Blender scene to La Jolla and rendered correctly.



A rendered Blender-converted scene using DisneyBSDF.



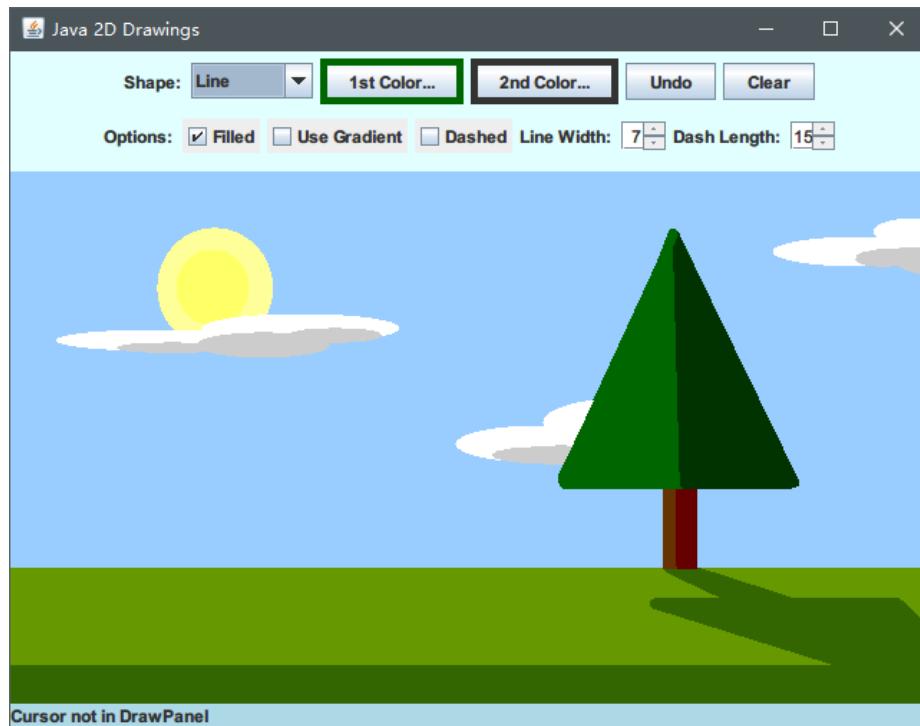
A rendered sample using DisneyGlass material

## SVE-Optimized Matrix Multiplication

- Implemented and modified BLISlab GEMM blocking algorithm in C.
- Improve row-major matrix multiplication efficiency, reducing cache misses on AWS EC2 Ubuntu machines by more than 33%.
- Accelerated microkernel by 4x with ARM SVE, loop unrolling, and pointer techniques (comparing to naïve).

## Java Painting GUI

- A Painter GUI implemented using Java with [SpringLayout](#).
- Support 1st / 2nd colors, different shapes and lines, and options including stroke parameter, filled, gradients, and dashed.



My masterpiece of a beautiful scenery!

## User-Book Read and Rating Prediction for Recommender System

- Predict whether a user reads a book in various approaches and compared their performance, including:
  - Logistic Regression
  - Bayesian Personalized Ranking (Implicit)
  - \*Trivial thresholds based on Popularity & Jaccard / CosineSet Similarities
- Predict a user's rating on a given book:
  - \*BiasOnly Latent Factor Model (Surprise, Tensorflow, & PyTorch)
  - Latent Factor Model w/ Dimensionality Reduction (Tensorflow)

## Simulation of OS Components - CPU & I/O Task Scheduler, Memory & Disk, File System

- Used C to emulate the following components:
  - multi-threaded CPU/IO task schedulers,
  - disk and virtual memory access with support of TLB and second-level page table, and
  - a file system with symbolic links and security constraints.