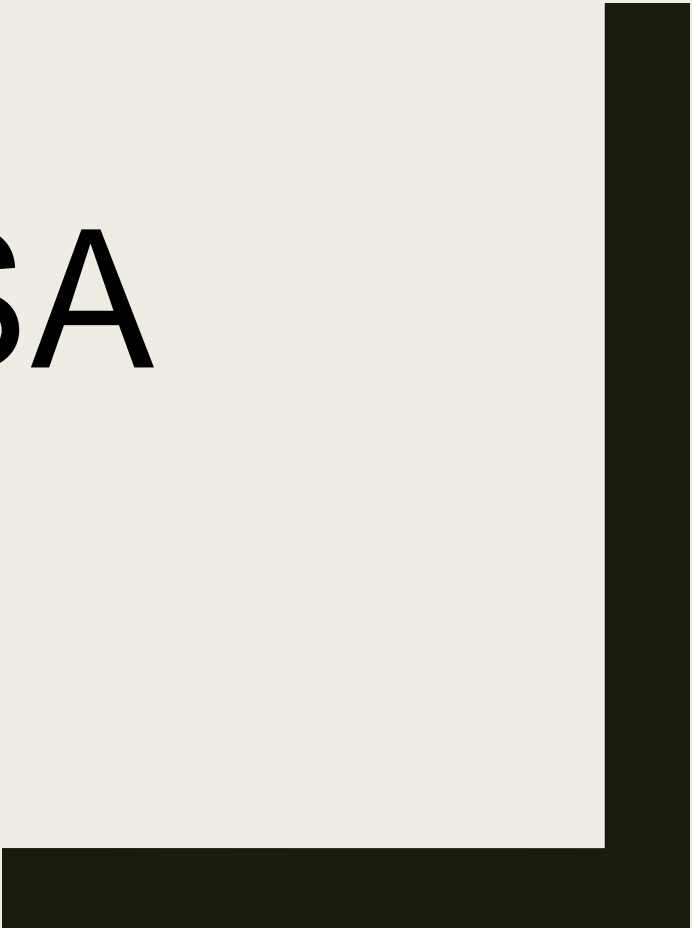


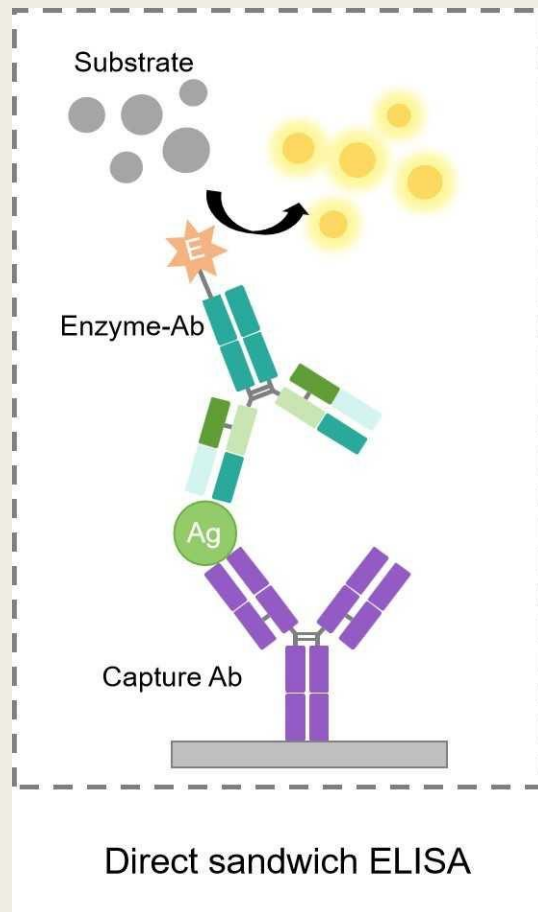


model_ELISA

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BIOEN 537



Background



<https://www.antibody-creativebiolabs.com/sandwich-elisa-with-streptavidin-biotin-detection.htm>

- An **enzyme-linked immunosorbent assay** or ELISA is used to identify and/or quantify proteins.
- There are multiple different varieties of ELISAs, however one of the most commonly used is the **direct sandwich ELISA**.
- Given its detection abilities, it is highly useful for diagnosing various diseases from immune system disorders to infections.

ELISA development and optimization requires researchers to perform benchtop experiments that are often cumbersome and necessitate many experiments

Problem

This tool allows the user to mimic sandwich ELISA component relationships with ease

Solution

User cases:

Use case #1

Identifying which components are in excess

Use case #2

Seeing how temperature changes affect each step by altering kinetic constants

Use case #3

Determining when steady state occurs to find minimum reaction time

Users:

Users #1

For lab use:

Researchers with a general knowledge of sandwich ELISAs and assay development.

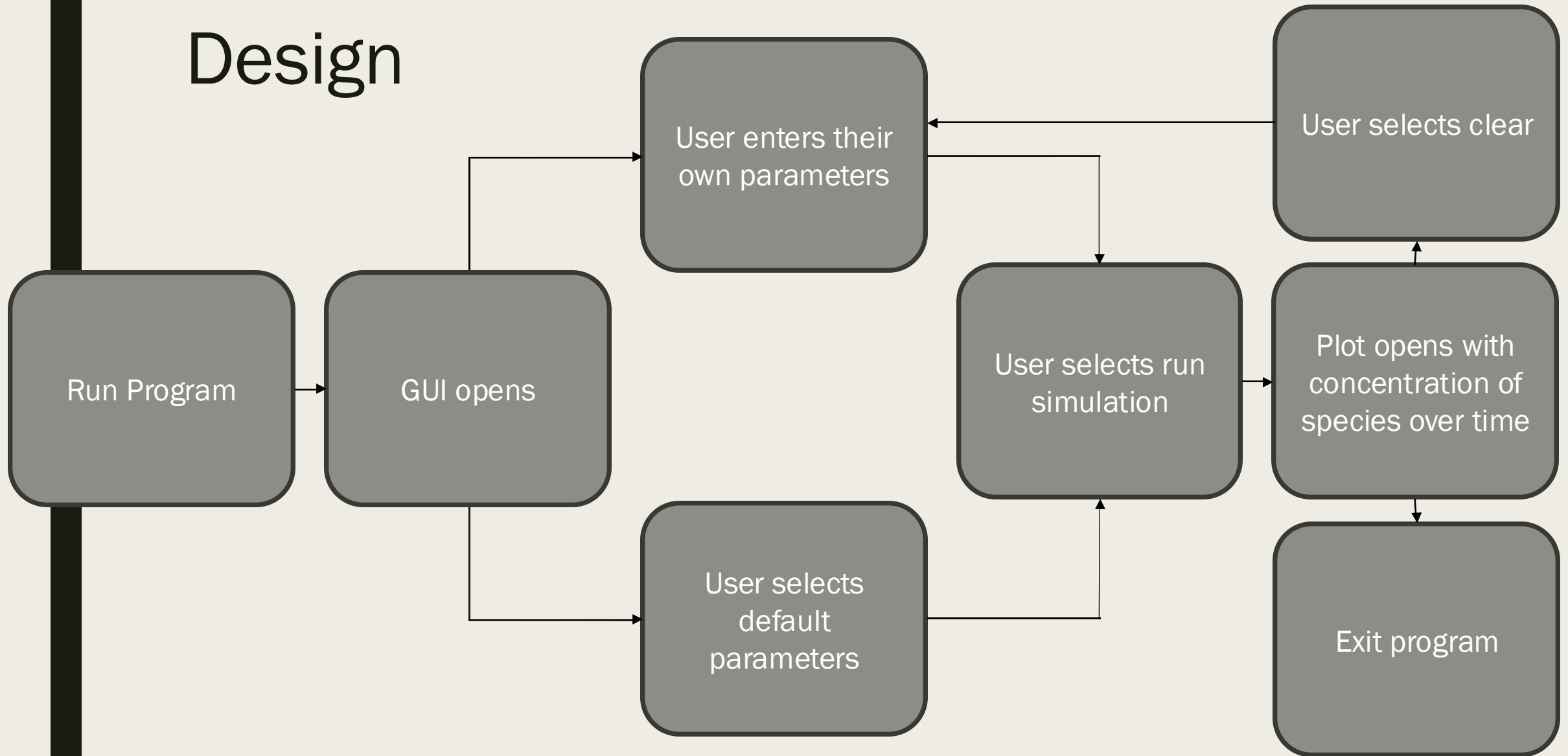
Generally, these users are predicted to have programming experience in python.

User #2

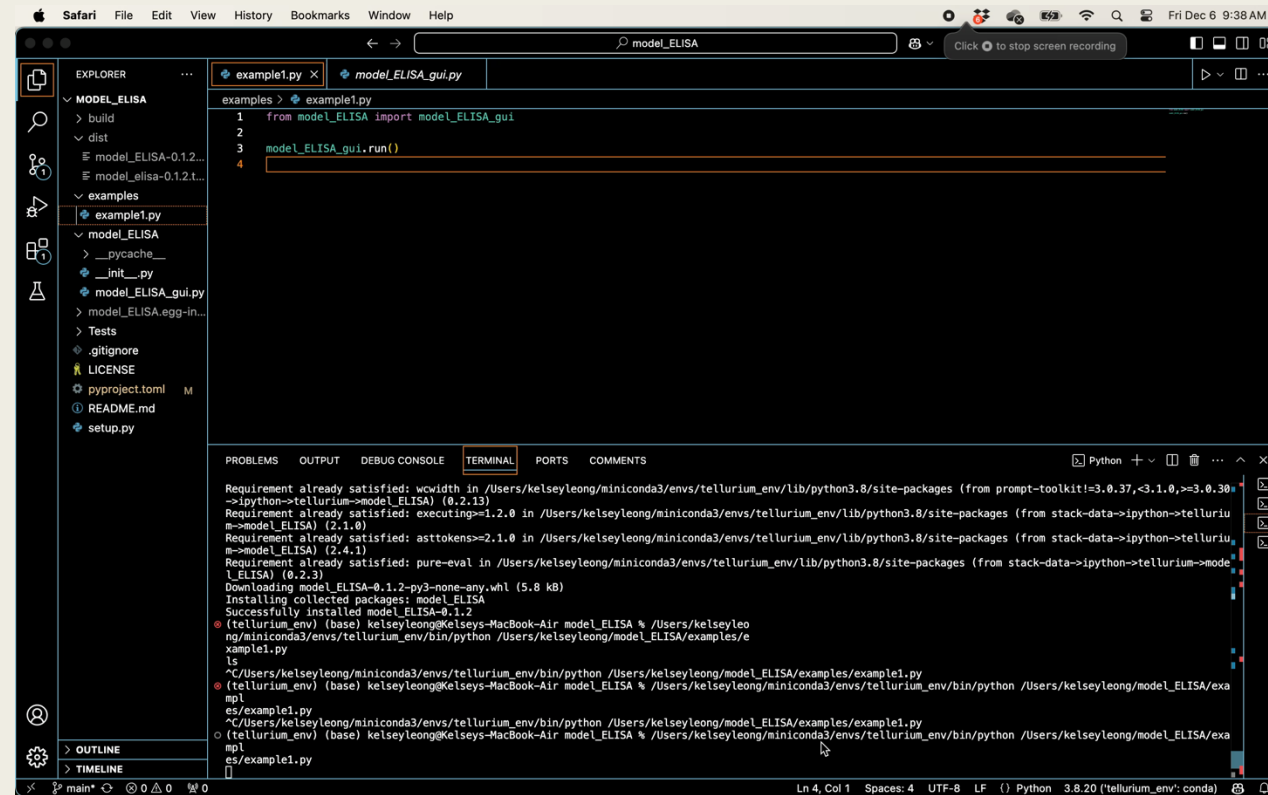
For education purposes:

Users with minimal python knowledge who want to use the package to learn more about how an ELISA works.

Design



Demo



The screenshot shows a code editor interface with a dark theme. The Explorer panel on the left shows a project structure for 'MODEL_ELISA' with files like 'example1.py' and 'model_ELISA_gui.py'. The main editor area displays the content of 'example1.py', which is a simple Python script that imports 'model_ELISA_gui' and calls its 'run()' method. Below the editor, the Terminal panel shows the output of running the script. The output indicates that the required packages are already satisfied and that the script was successfully installed and executed. The status bar at the bottom shows the current file is 'main*' and the editor is using Python 3.8.20 in a 'conda' environment.

```
from model_ELISA import model_ELISA_gui
model_ELISA_gui.run()
```

```
Requirement already satisfied: wcwidth in /Users/kelseyleong/miniconda3/envs/tellurium_env/lib/python3.8/site-packages (from prompt-toolkit!=3.0.37,<3.1.0,>=3.0.30->ipython->tellurium->model_ELISA) (0.2.13)
Requirement already satisfied: executing>=1.2.0 in /Users/kelseyleong/miniconda3/envs/tellurium_env/lib/python3.8/site-packages (from stack-data->ipython->tellurium->model_ELISA) (2.1.0)
Requirement already satisfied: asttokens>=2.1.0 in /Users/kelseyleong/miniconda3/envs/tellurium_env/lib/python3.8/site-packages (from stack-data->ipython->tellurium->model_ELISA) (2.4.1)
Requirement already satisfied: pure-eval in /Users/kelseyleong/miniconda3/envs/tellurium_env/lib/python3.8/site-packages (from stack-data->ipython->tellurium->model_ELISA) (0.2.3)
Downloading model_ELISA-0.1.2-py3-none-any.whl (5.8 kB)
Installing collected packages: model_ELISA
Successfully installed model_ELISA-0.1.2
(tellurium_env) (base) kelseyleong@Kelseys-MacBook-Air model_ELISA % /Users/kelseyleong/miniconda3/envs/tellurium_env/bin/python /Users/kelseyleong/model_ELISA/examples/example1.py
ls
^C/Users/kelseyleong/miniconda3/envs/tellurium_env/bin/python /Users/kelseyleong/model_ELISA/examples/example1.py
(tellurium_env) (base) kelseyleong@Kelseys-MacBook-Air model_ELISA % /Users/kelseyleong/miniconda3/envs/tellurium_env/bin/python /Users/kelseyleong/model_ELISA/examples/example1.py
^C/Users/kelseyleong/miniconda3/envs/tellurium_env/bin/python /Users/kelseyleong/model_ELISA/examples/example1.py
(tellurium_env) (base) kelseyleong@Kelseys-MacBook-Air model_ELISA % /Users/kelseyleong/miniconda3/envs/tellurium_env/bin/python /Users/kelseyleong/model_ELISA/examples/example1.py
```

Github repo: https://github.com/kml5gb/model_ELISA.git

The screenshot shows the GitHub repository page for **model_ELISA** by user **kml5gb**. The repository is public and has 1 branch and 0 tags. It has 13 commits, 0 stars, and 0 forks. The repository description is: "Creates a GUI which simulates the mechanisms of a direct Sandwich ELISA".

The file list shows the following files and their commit history:

File	Commit Message	Time Ago
Tests	Updates to create package	4 hours ago
docs	Add files via upload	3 hours ago
examples	Updates to create package	4 hours ago
model_ELISA	Updates to create package	4 hours ago
.gitignore	Initial commit	8 hours ago
LICENSE	Initial commit	8 hours ago
README.md	Update README.md	5 hours ago
pyproject.toml	Updates to create package	4 hours ago
setup.py	Updates to create package	4 hours ago

The README section is visible, showing the title **model_ELISA** and the description: "Creates a GUI which simulates the mechanisms of a direct Sandwich ELISA". Below this, it states: "An enzyme-linked immunosorbant assay or ELISA is used to identify and/or quantify proteins. Given its detection capability, it is highly useful for diagnosing various diseases from immu-".

The right sidebar shows the repository's activity and statistics:

- About:** Creates a GUI which simulates the mechanisms of a direct Sandwich ELISA. Includes links to Readme, MIT license, and Activity.
- Releases:** No releases published. [Create a new release](#)
- Packages:** No packages published. [Publish your first package](#)
- Languages:** Python 100.0%

Lessons learned and future work

Lessons learned

- First time creating a GUI -> tkinter
- Gained more experience working with Tellurium
- First time using unittest to test a program
- Learned proper code documentation
- Gained more experience debugging

Future work

- Add more advanced kinetics/variables to more closely mimic the relationships
- Expand the simulation to more types of ELISAs
- Add additional functionality to the GUI as I continue to use it in my lab
- Add more functionality in case of user errors