# Code Management and Data Storage

We propose the use of GitHub, based on Git. This service provides a combination of version control, web hosting, organizational pages, and permanent code and data storage. GitHub will be used to provide the manuscript’s source code and data sets under 2 GB. For larger datasets (20 GB – 2 TB), permanent storage and DOI handling can be handled via generalist repository. Options include Dryad, Figshare, OSF, Vivli, and Zenodo.

# Model Hosting

Beyond hosting data and code in a permanent manner via GitHub and/or generalist repository, we propose a website to host live, interactive versions of all published models. A permanent sub-domain of the lab’s website [https://ambersmithlab.com/] will host pages for each model, outlining the publication and implementation while providing a live demonstration using PyScript (Figure 1).

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**Figure 1.** PyScript and Plotly website design for model hosting. Model from 10.3389/fmicb.2018.01554.

PyScript is a framework that leverages WebAssembly and Pyodide to execute Python code in Hypertext Markup Language (HTML) websites without the need for a server-side environment or local installation. This allows immediate and free access to running models and source code for any reader. Live demo models with dependencies not covered in Pyodide could alternatively be hosted on a computational cloud platform such as Google Colab, Kaggle Kernels, or Microsoft Azure Notebooks. If the Python models require significant processing power, running client-side (in the user's browser) might not be feasible. In such cases, tools like Flask and Django can provide server-side computation.

Plotly is a graphing library to create interactive web plots. Plotly integrates with matplotlib and other Python plotting libraries, providing broad visualization options. To provide a user interface, React (a Javascript library) passes the interface changes to Python and dynamically updates the page content based on the model solutions. Plotly acts in tandem with React to embed these interactive charts and graphs. Additional necessary React tools include Webpack (asset and site optimization) and Babel (transpilation, or backwards compatibility for older devices).

# Costs

The estimated costs for the development and maintenance of a comprehensive website, inclusive of GitHub repository management, live model demonstration pages, and data management, necessitate a diverse skill set. We anticipate the need to engage a full-stack developer, or a team thereof, with the expertise to construct and maintain such a platform. The development phase, encompassing website design, GitHub integration, and live model implementation, may range from $20,000 to $50,000, depending on the project's complexity and design intricacies. Ongoing maintenance and hosting costs are estimated at $1,000 to $3,000 annually. The salary for a skilled full-stack developer, responsible for these tasks, is expected to fall between $70,000 and $120,000 annually, subject to regional salary standards and the individual's experience level. This investment ensures a robust, user-friendly, and secure platform, essential for the successful dissemination and interaction with our research models and data.

# Existing Model Repositories (Inspiration and Competition)

Two prominent databases for biological models are ndexbio and biomodels (Interfaces in Figures 2 and 3). Biomodels contains just 3 ODE models of influenza, all over 10 years old.

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<https://www.ndexbio.org/>

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<https://www.ebi.ac.uk/biomodels/>

HuggingFace is one of the most popular machine learning and natural language processing model repositories. It features searching, browsing, tagging, data storage, and cloud execution/training. Many of these features are ambitious and unnecessary for our purposes, but the website provides a shining example of organized knowledge.

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<https://huggingface.co/models>