

Enabling Scientific Collaboration at UCI Yassa Lab

The UC Irvine Yassa Lab and Flywheel are accelerating scientific collaboration around the globe by sharing data, analytic processes, and passion for understanding brain diseases.

- Under Dr. Yassa's lead, Flywheel secures the data and streamlines computational processing for diverse neuroimaging projects at UC Irvine.
- Multicenter research on Alzheimer's Disease and Down Syndrome is advanced in a cost-effective research data platform for collaborators around the world.
- An advanced lab creates a Collaborative for shared computing resources, data, and algorithms for scientists to work together across labs on common problems.

Given the increasing size of data, growing complexity of data analysis, and the need for greater collaboration both within and between institutions, how can imaging research centers deliver best-in-class support for their researchers?

Dr. Michael Yassa, Ph.D., Director of the Translational Neurobiology Lab at the University of California, Irvine (UCI), is pioneering a new approach to scientific collaboration by systematically sharing data and algorithms that can lead to faster discoveries.

The Yassa Lab studies changes in memory over a lifetime, methods for diagnosing progressive brain diseases and mood disorders, and paths to treatment. In 2017, his lab was facing a number of growing challenges including:

- How to manage multi-center collaboration involving collection of large data sets, quality control, analysis, and ultimately submission to NIH databases
- Growing data and analytic complexity impeding data reuse and scientific reproducibility
- How to best support and collaborate with other labs in the UC Irvine community

Improving Multicenter Collaboration

Dr. Yassa's lab serves as the data core for a multicenter collaboration with Principal Investigator Dr. Nicole Schupf and Dr. Adam Brickman of Columbia University and Dr. Diana Rosas of Massachusetts General Hospital (MGH) on biomarkers of Alzheimer's disease in Down syndrome. The study investigates whether immunological factors active in Down syndrome are also involved in Alzheimer's Disease, which may fit into the amyloid hypothesis.

Longitudinal studies of neurocognitive stability like this require that researchers securely share and process a variety of data including blood-based biomarkers, imaging biomarkers, clinical and demographic data, and genetic variant information. Further, the data must be quality controlled, processed consistently via complex analytic pipelines, and fully documented to support the conclusions and reproducibility of the study.

After seeing the Flywheel system in action at Columbia's Zuckerman Institute, the team chose to adopt the Flywheel research data management platform to streamline collaboration and core operations for this project. Dr. Yassa's lab deployed Flywheel on Google Cloud Platform to simplify data transfer from collaborators and automate and document computational processing ranging from quality control to image analysis.

With Flywheel, Dr. Yassa and his team at UC Irvine can push data to the project directly from their MRI scanner through Flywheel's DICOM connector. Remote users easily transfer data to the project via command line tools or a drag and drop web uploader. Once data lands in the system, rules control automated conversion from DICOM to NIfTI format using Dcm2Nii, execution of quality control algorithms, such as MRIQC, and analytic applications such as Freesurfer and fMRIPrep. All data and analytic results are available to project members via a secure web browser interface with access controls. Metadata for data and analyses are indexed and available through powerful search tools, and are available programmatically via SDKs for MATLAB and Python for use in further exploratory analysis.



Flywheel helps us work efficiently across locations. We save time and can work together on the data and analyses more effectively. We also have the confidence that all of the data has been quality controlled, processed consistently, and documented to support our analyses"

— Dr. Michael Yassa, Ph.D., Director of the Translational Neurobiology Lab at the University of California, Irvine

Managing Growing Complexity in the Lab

Based on his experience with Flywheel for the multi-center project, Dr. Yassa saw an opportunity to improve operations in his lab.

Dr. Yassa's lab routinely collects and analyzes large, complex imaging data from a variety of MRI systems, including Siemens, Philips, and Bruker scanners. Once the data is collected, there are many steps required to prepare the data for analysis, including copying data to a networked file system, organizing the data into folders, visual inspection, running quality control scripts, performing format conversions, and running pre-processing algorithms. As data sets are getting larger, and processing complexity is intensifying, these activities are increasingly time consuming and error prone, often taking an hour to two hours for each participant data set. Further, these manual activities don't provide a way to track the details required to ensure consistency and reproducibility.

Dr. Yassa decided to use Flywheel to automate data management workflow and analysis for his lab. Data from the various scanners is now pushed as DICOMs directly to a project in Flywheel where rules and applications (Gears) automate pre-processing, such as quality control and format conversions, and analytic processing, such as Freesurfer segmentations. All processing steps are fully recorded to ensure quality and consistency, and to support reproducibility. Further, all data and analytic results are fully searchable. As a result, Dr. Yassa's team is able to work more productively and has the information needed to ensure the scientific integrity of their work.

Dr. Yassa also saw an opportunity to get more value from data collected for past projects. He has subsequently loaded the majority of his lab's historical imaging data into Flywheel and used the platform's automation capabilities to quality control and pre-process data to a common standard. As a result, his team can easily search and select data for use in new projects and collaborate more effectively.

Improving Collaboration between Labs

With the success improving data reuse in his own lab, Dr. Yassa saw an opportunity to improve collaboration and assist other labs across UC Irvine. Newer labs often have great skills, but may lack access to data and technical expertise to support their work. He saw a way to share his data and technical resources and get labs pursuing related areas of study working together.

Dr. Yassa now uses Flywheel as the foundation for a collaborative environment involving multiple labs across UC Irvine. With Flywheel, he is able to easily and securely share data with other labs for seed studies and to support grant applications. He can share complex algorithms with other labs using Flywheel gears, making them easier to use. Further, labs can work together on projects using Flywheel's secure access controls, to view and analyze data.



Flywheel has really been a game changer for us. Our vision for the future is entirely founded on team science and collaboration, which can get tricky without robust infrastructure and appropriate technology. Flywheel has been a one-stop shop solution to provide this technology"

— Dr. Michael Yassa, Ph.D., Director of the Translational Neurobiology Lab at the University of California, Irvine

About Flywheel

Flywheel is the leading research data platform that's transforming the way research and biomedical and imaging data are managed at leading life sciences, clinical, and academic institutions globally. Flywheel provides a comprehensive research data solution with all the tools needed for curation, image processing, machine learning workflows, and secure collaboration. Flywheel is headquartered in Minneapolis, MN, and has offices in the Bay Area, Boston, and Budapest. For more information on our mission and products, visit www.flywheel.io