AUTOMATED MRI DATA ANALYSIS

Mentor: Dr. Andrew Bender
Author: Garrett Collier

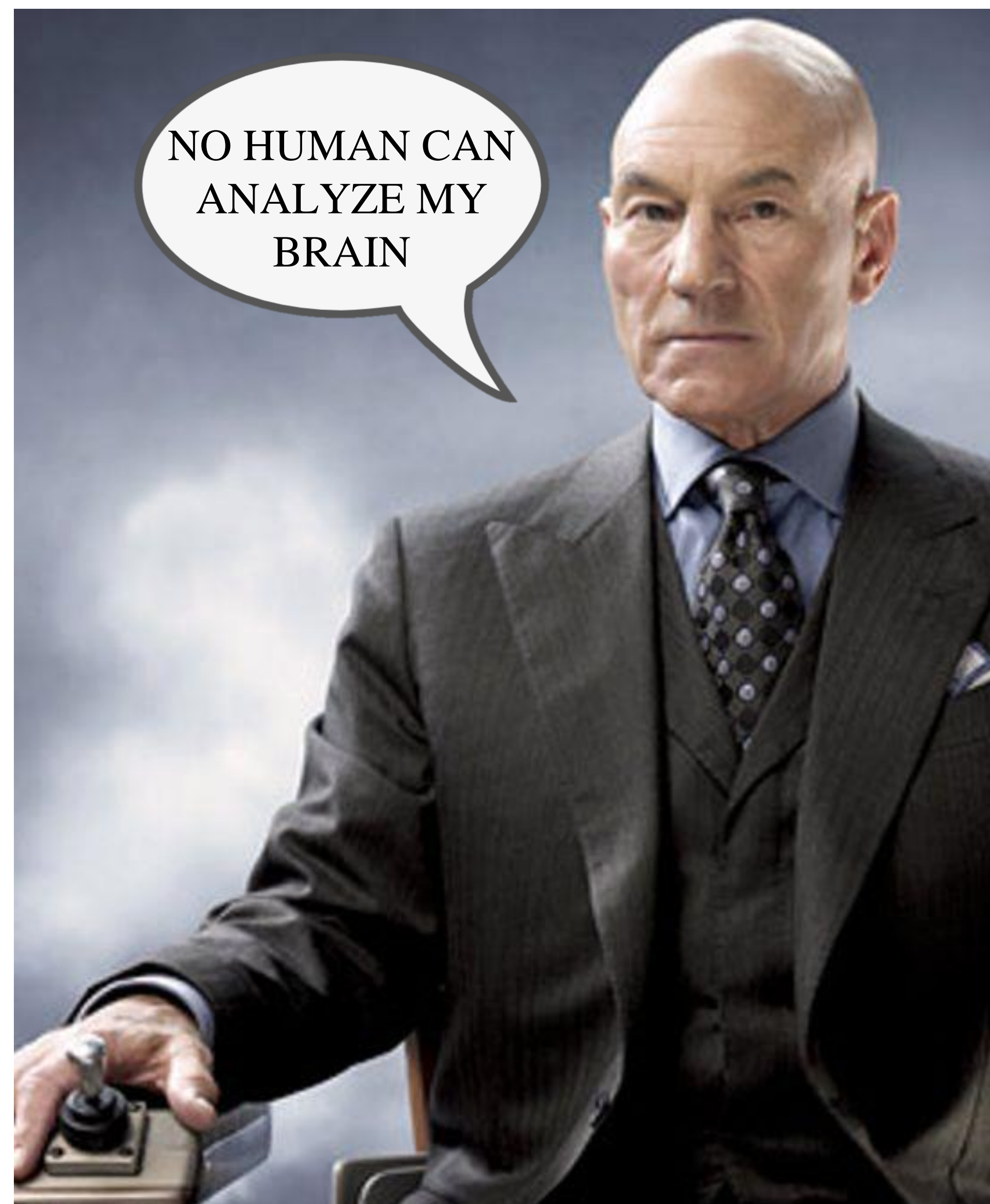**MSU Departments of Neurology and CMSE**

Background

With MRI Data becoming more complex and the world continuing to rely heavily on data and programming, it makes sense to **automate the process of MRI Data Analysis** using computers.

Dr. Bender, roughly 2 years ago, began the process of this automation through his creation of two **BASH scripts.**

I was tasked with creating a much more **effective** and **efficient** model of this automation, while promoting **voxel-wise throughput imaging** using **Python**.
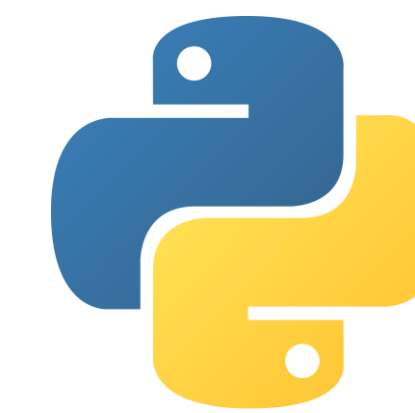
NO HUMAN CAN ANALYZE MY BRAIN

NOW WE CAN!

Objectives

Promote high **throughput voxel-wise analysis**
Enhance **Functionality** through:
o   Flexible Setup of MRI Variables
o   HPCC Script Updates:
        - **Configuration file**
        - File linking
Establish **Error Checking**
Improve Output Files by **adding**:
o   **Parallel** Comparisons
o   Post Hoc Testing
o   Enhancements to Contrast Matrix
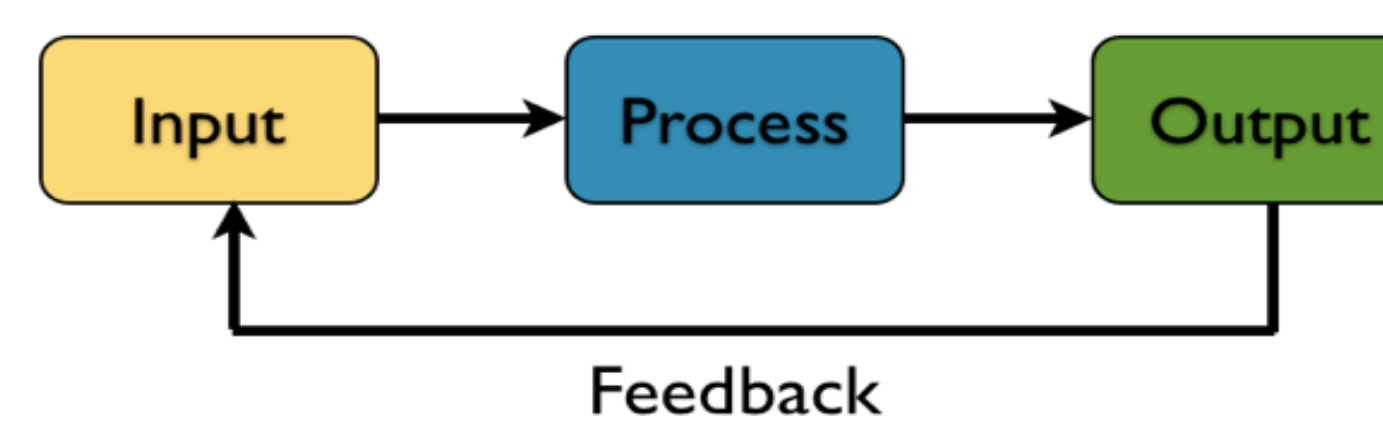   - **Regressor** and **Covariates**
Improve **Transparency** of Reporting Data and Effects
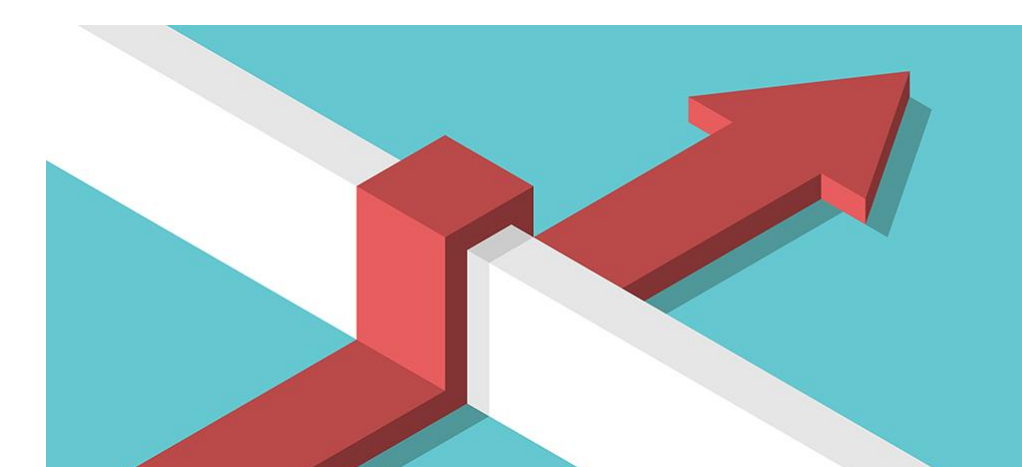Provide a **Universal Foundation** for Automated Data Analysis

Methods

o   **Evaluate** initial BASH script methods
o   Translate **BASH** commands to **Python**
o   New **feature development** in consultation
o   Test and **bug fixing** with user feedback
o   **Deploy** to Research Group for **Testing**
o   **Maintain** scripts and **Develop** Documentation

Input → Process → Output
Feedback

Challenges Overcome

o   **Limited knowledge** in:
        - MRI Data/Neuroscience
        - BASH coding language
o   **Different versions** of:
        - Python
        - HPCC modules

Conclusion

I **created** two **Python scripts**, and they have been **updated**, **tested**, and **deployed** for use in our research group and they will be made available on a public repository to allow for **enhanced flexibility** and **reproducibility** and **reduction** of potential user error. All objectives were met.

Next Steps

Future development will include:
o   Promoting **flexibility** to other **voxel-based analysis** software frameworks
o   Improving **data visualization** for analysis and reporting
o   Defining a **broader scope** for future project aspirations beyond **Alzheimer's disease** and **related dementias**

References

Michigan State University. "User Documentation." *ICER HPCC Documentation*, docs.icer.msu.edu

Bender, Dr. Andrew and Bender Lab Research Group. "OSF Wiki." *Bender Lab*, osf.io/m8s7q/wiki/home

GNU. "Bash Reference." *BASH Manual*, www.gnu.org/software/bash/manual/bash.html

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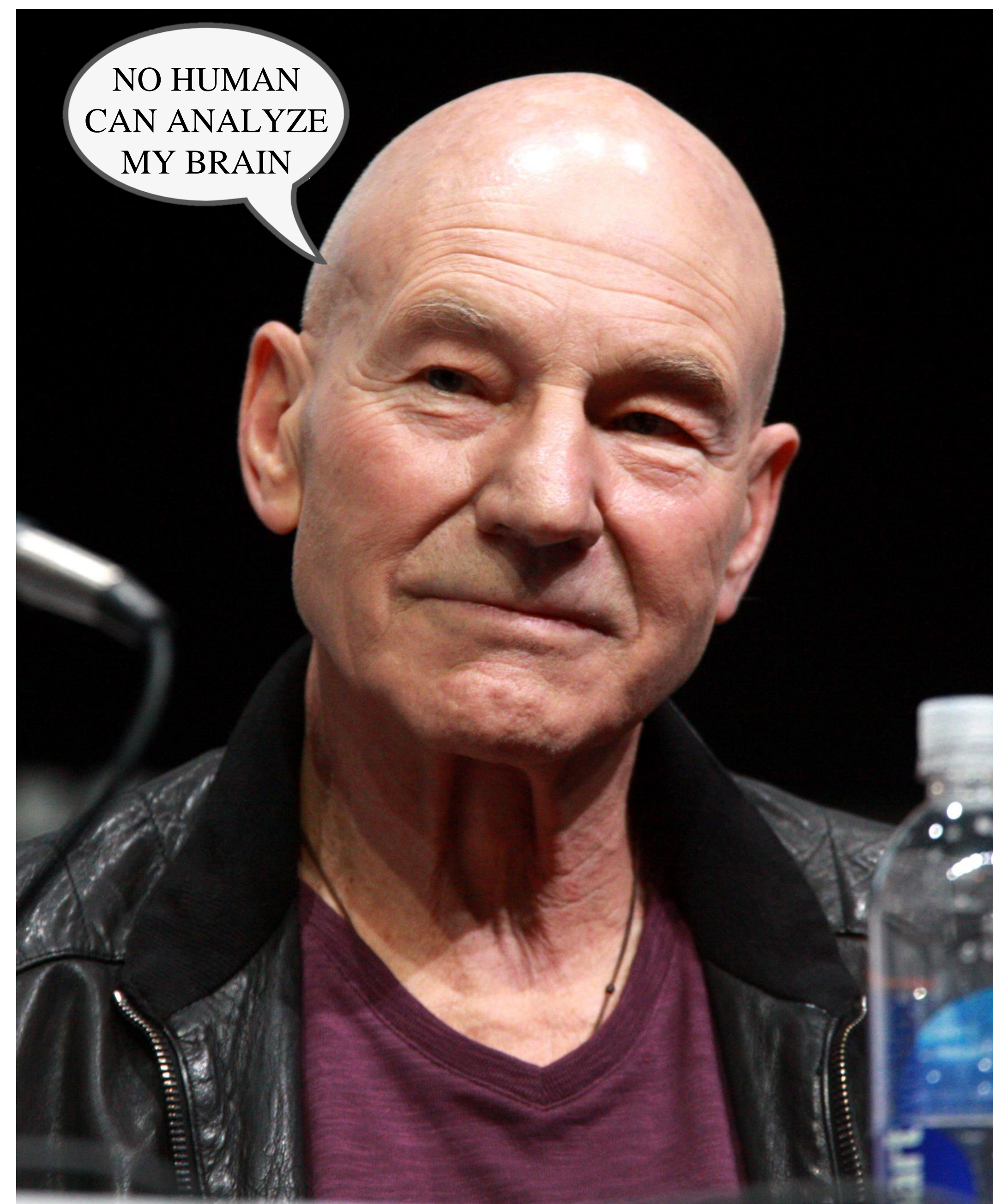
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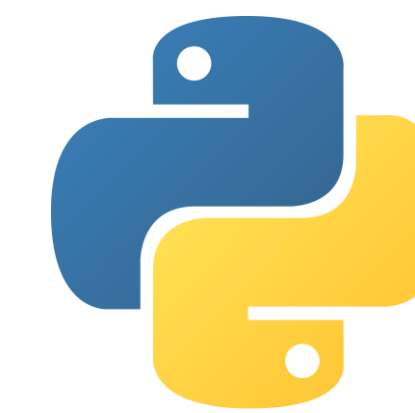
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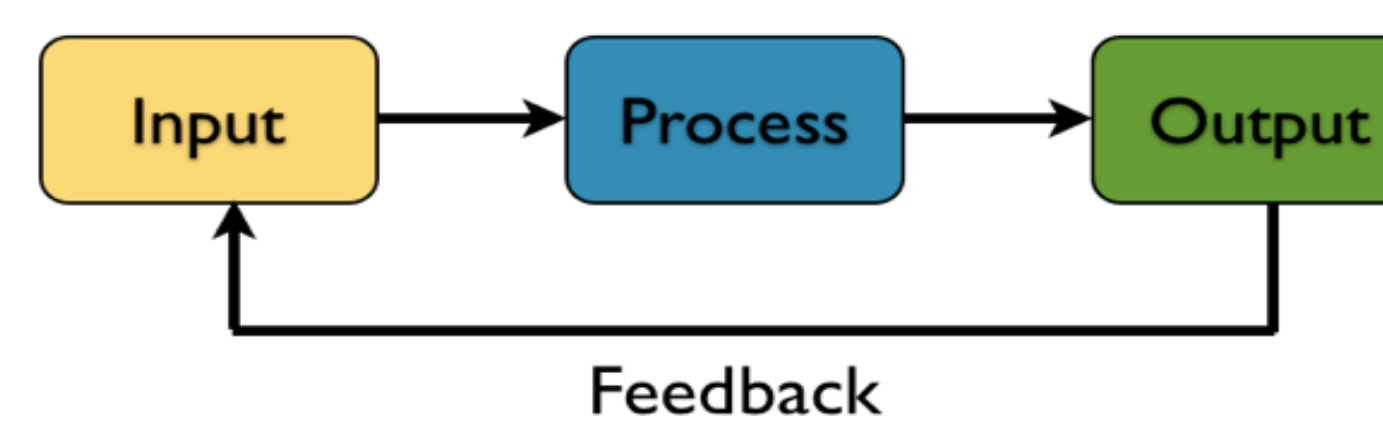   - **Regressor** and **Covariates**
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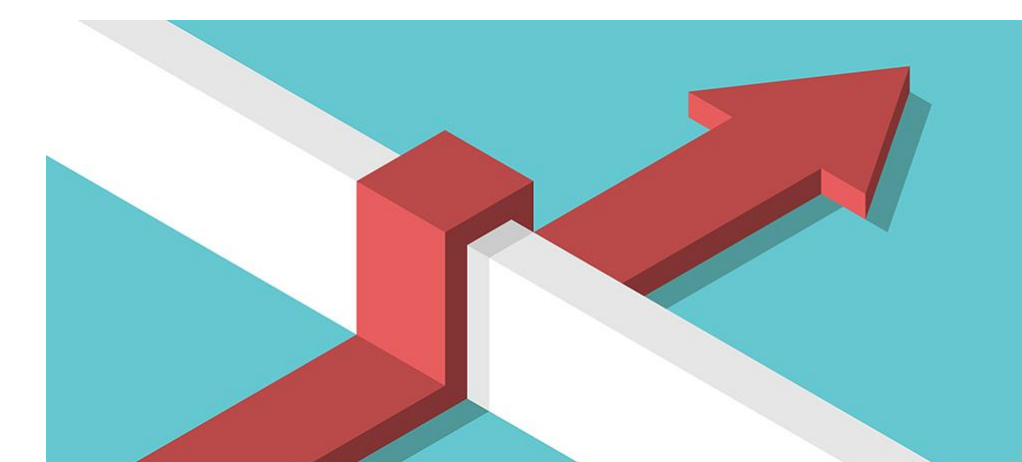Provide a **Universal Foundation** for Automated Data Analysis

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