# VAN PHAN

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## EDUCATION

**Georgia State University,** Atlanta, GA                                                    Expected Graduation: *May. 2027*

B.S. Mathematics, Concentration in Computer Science, GPA: 4.18/4.30

## WORK EXPERIENCE

**Undergraduate Research Assistant** and **Near-peer Mentor**                            *Jun. 2024 – Present*

*Center for the Advancement of Students and Alumni*                                          *Atlanta, GA*

- **Spearheaded a 3-member student team** in two concurrent computational biology projects, developing wound healing simulations and morphological analysis of Retinal Pigment Epithelial (RPE) cells, resulting in successful research presentations at the Summer Undergraduate Research Symposium 2024 and the Georgia State Undergraduate Research Conference 2025.
- Provided near-peer mentorship and research support to students in the Math Path program, guiding research technique implementation and project development for the Enhanced Physics-Informed Neural Networks for Collective Cancer Invasion project, resulting in **winning the best project** in the Summer Undergraduate Research Symposium 2025.

**Chemistry Laboratory Teaching Assistant**                                              *Aug. 2025 – Present*

*Georgia State University*                                                                  *Atlanta, GA*

- **Mentored 45 undergraduate students** in CHEM 1151L (Survey of Chemistry I), improving understanding of fundamental principles and reducing procedural errors through one-on-one guidance and demonstration of proper laboratory techniques.
- Enhanced student learning and scientific writing by evaluating pre-lab and post-lab reports for 10 experiments, providing detailed, constructive feedback on data interpretation, calculations, and conclusions.

## RESEARCH EXPERIENCE AND PROJECTS

**Neuromorphic Biocomputing: Neural Signaling Modeling & Visualization**                  *Nov. 2025 – Present*

- Engineered a modular biocomputing simulation framework in Python to model biological neural networks, implementing **FitzHugh-Nagumo** and **Hodgkin-Huxley differential equations (ODEs)** to simulate non-linear neuron dynamics and logic gate behaviors.
- Developed a robust uncertainty quantification pipeline using **Uncertainpy** and **Polynomial Chaos Expansion**, conducting sensitivity analysis on physiological parameters and recovery variable to validate signal propagation stability under noise.

**Morphological Feature Analysis of Retinal Pigment Epithelial Cell from Mice during Aging**    *Jun. 2024 – Aug. 2025*

- Developed an automated, config-driven **7-step end-to-end machine learning pipeline** for classifying Retinal Pigment Epithelial (RPE) cell during aging, integrating image processing, feature extraction, data cleaning, model training, artifact management, classification reporting, and analysis - enhancing workflow efficiency, scalability, and reproducibility.
- Achieved **99%+ cross-validation F1-score** by extracting **133 morphological and texture-based features** (LBP, GLCM, Gabor) from 326 RPE cell images using Python, scikit-image, and OpenCV; implemented a **stacking ensemble of XGBoost, LightGBM, and CatBoost with a Logistic Regression meta-learner**, resulting in highly accurate classification.
- Designed and implemented computational models in **CompuCell3D** and Python to simulate RPE wound healing dynamics, successfully **replicating both fusion and purse-string closure mechanisms** *in silico*; analyzed model outputs to assess the impact of parameter perturbations on healing rates and tissue stability, generating insights for potential therapeutic strategies in Age-related Macular Degeneration.

**Enhanced Physics-Informed Neural Networks for Collective Cancer Invasion**                *Jun. 2025 – Aug. 2025*

- Engineered a **Physics-Informed Neural Networks (PINNs)** model to simulate collective cancer invasion, a two-species system, resulting in a data-efficient, mesh-free solution for complex Partial Differential Equations (PDEs).
- Developed a framework utilizing **Tensorized Fourier Neural Operators (TFNO)** and PyTorch's autograd engine to encode physical laws (PDEs, boundary, and initial conditions) directly into the model's loss function, reducing reliance on labeled data.
- Explored advanced techniques, including a sequence-to-sequence **(Seq2seq) PINO** approach and **Augmented Lagrangian methods (ALM)**, to overcome model failure modes like vanishing gradients and improve solution accuracy and stability.

## TECHNICAL SKILL

- **Programming & Tools:** Python, SQL, LaTex, Command Line (Linux/MacOS), Git/Github, CompuCell3D, Microsoft Office Suite
- **ML/DL:** Physics-Informed Neural Networks (PINNs), Seq2seq Models, Tensorized Fourier Neural Operators (TFNO), PDE Modeling, Augmented Lagrangian method (ALM), Ensemble Methods (Stacking, Boosting), Uncertainty Quantification (UQ), Polynomial Chaos Expansion
- **Libraries:** PyTorch, TensorFlow, Scikit-learn, Pandas, NumPy, SciPy, Matplotlib, Seaborn**,** OpenCV, Scikit-image, Mahotas, Pillow, Brian2, Manim, Uncertainpy, Chaospy