Boris Boyanov Tomov

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EDUCATION

University of California, Berkeley **2021 – 2025**
Data Science + Robotics, Computer Science minor

RELEVANT COURSEWORK

Structure, Design and Implementation of Computer Programs, Data Structures and Programming Methodology, Designing Hardware Informational Systems I & II, Discrete Mathematics and Probability Theory, Data Analysis, Inferential Thinking and Intro to Machine Learning, Intro to Artificial Intelligence, Efficient Algorithms, Principles of Data Science, Designing, Visualizing and Understanding Deep Neural Networks, Design of Microprocessor-Based Mechanical Systems

WORK EXPERIENCE & PROJECTS

Robotic Finger with Independent Joint Control & CV-teleoperation - March 2025 – May 2025
Project Report: ProjectReport | FreeRTOS, LabVIEW, ESP32, FSR sensors, OpenCV & MediaPipe

- Engineered a robotic finger with independent joint control, **integrating real-time PD feedback on ESP32** for adaptive grip **using FSR sensors and multitasking via FreeRTOS**.
- Developed a **Computer Vision pipeline** using **OpenCV** and **MediaPipe** to extract joint angles from human hand motion, enabling natural gesture replication. Streamed processed CV data in JSON format to **LabVIEW** over TCP, creating a synchronized human–robot teleoperation loop with a live interactive GUI and low latency.
- Developed a **LabVIEW GUI** for teleoperation, featuring a draggable 2D workspace, live angle and force visualization, and dual-mode (manual/auto) control over serial communication as well as interrupt support.

Geo-localization with k-NN
IM2SPAIN: Nearest Neighbors for CLIP Embedding Regression

- Predicted geographic coordinates of images using CLIP embeddings and k-NN regression.
- Visualized feature clusters via PCA and analyzed spatial patterns in embedding space.
- Tuned hyperparameter *k* using grid search; implemented distance-weighted regression to improve accuracy.
- Compared performance of k-NN and linear regression on increasing dataset sizes; analyzed scaling behavior and generalization.
- Achieved significant MDE reduction over constant baseline; evaluated trade-offs in bias-variance across models.

Robotics and Embedded Software Engineer @ Recursive Pioneers - September 2024 - March 2025
Publication: ELALCANCE-Robotic System | Fusion 360, LeRobot Kinematics, OpenCV & MediaPipe, RL, HuggingFace

- Successfully developed a highly efficient low-cost robotic system for Tukuypaj, a non-profit organization supporting quadriplegic individuals in Chile, addressing manpower shortages during mealtimes. As a software side lead I **developed embedded scripts for Computer Vision open-mouth detection**, which utilize **MediaPipe** model inference, capable of recognizing changes in the user's facial state smoothly and reliably at 30 fps – handling sudden interrupts & safety mechanisms.
- Optimized data collection scene design and gathered large sets of teleoperation data for feeding movements. **Employed Reinforcement Learning methods to train an ACT feeding policy with high validation accuracy**, generalizing feeding tasks, and making the system perform well in a variety of different environmental settings.
- Spring 2025: our project was referenced as course material for Introduction to Cognitive Science at UC Berkeley.

Multiclass Language Classification from Surnames – Character-Level RNN September 2024
Sequence Modeling, Language Classification, PyTorch

- Achieved high-accuracy classification of surname origin across 18+ language classes by training a character-level recurrent neural network on labeled name data.
- Processed variable-length name strings into sequential one-hot tensors; trained using NLL loss and SGD with gradient clipping to ensure stable convergence.
- Tuned hidden state dimensionality and learning rate for optimal generalization; final model demonstrated strong performance on unseen names and minority classes.

Leadership/Impact

Internal Vice President @ Code for Good Berkeley – May 2024 – current

- Improved internal club operations, structure, and technological impact - achieving almost 100% member retention rate, bumping club budget by more than 175%, and sustainably scaling operations through successful recruitment strategies, **establishing and leading the club's first-ever Robotics Research branch**.
- Contributed to wider campus recognition and professional involvement by negotiating partnerships with external tech organizations like **TikTok, Planned Parenthood, Think of Us, Carbon Sustain (Berkeley Skydeck), Linens N' Love Connected**, and more.

Programming Languages/Skills

WebDev & SWE: *AWS (EC2, S3, RDS, Lambda & more), SQL & NoSQL Databases, HTML, CSS, JS, Node JS, React JS, React Native, APIs, Django, Expo Go,* **Data Science & ML:** *Models, Optimization & Analysis, PyTorch & TensorFlow, MediaPipe, Neural Networks, RL: ACT, policy learning & iteration*. **Hardware:** *Microcontrollers & Microprocessors***,** *Servomotors, CADing: Fusion, Autodesk 3Ds Max***,** *3D Printing*