JEFFERSON ENRIQUE HERNANDEZ CEVALLOS

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SUMMARY

- Ph.D student at Rice University advised by Vicente Ordóñez-Román, working on self-supervision on video inputs using masked auto-encoders as well as increasing the capabilities vision and language models and adding new modalities. I have also received some funding from Google under the CURe program and TPU research program for my projects.
- Ph.D. student with skills and experience in Computer Science, Machine Learning, Computer Vision, and Big Data Analysis with three first-author publications.
- Participated in projects on spatiotemporal sequence modeling, human action recognition, and multi-object tracking, resulting in 7 peer-reviewed publications.
- Collaborative, observer, and problem-solving professional with great adaptability and self-educate capacity.

RESEARCH AND WORK EXPERIENCE

Rice University **Vision, Language and Learning Lab (vislang)**
Ph.D. student *Aug 2022 to present*

- Research on GenLLaVA, a method that integrates image generation capabilities to Large Vision and Language Models (LVLMs) using generative instruction tuning.
- Research on ViC-MAE, a method that integrates Masked Autoencoders (MAEs) and contrastive learning to improve self-supervised learning from both images and videos. Accepted to ECCV 2024.
- Work on incorporating videos to the `ffcv` library so that they can be loaded faster. I have seen speed-ups of 2x-5x compared to PyToch dataloaders.

Adobe Inc. **Adobe Research**
Research Intern *May 2024 to Aug 2024*

- Research on improving the reasoning capabilities of Large Vision and Language models (LVLMs) using pseudo-rewards and alignment methods such as Direct Preference Optimization (DPO), Best-of-N supervised fine-tuning. Our method allows for various rounds of self-improvement in a loop. In the end, our models improved 19% over baselines on 15 VLM benchmarks.

AdaViv **AdaViV**
Computer Vision Engineer *Dec 2022 to Aug 2022*

- Manage the whole computer vision Pipeline on AWS.
- Train and deploy image segmentation models for plant part segmentation.
- Reduce inference cost across the board by introducing several optimizations from $ 5 per 1K images to $ 0.50 per 1K images.
- Develop, curate, and maintain image segmentation datasets using pseudo-labeling to reduce costs.
- Coordinate and manage efficient data labeling pipelines.

Escuela Superior Politécnica del Litoral **Industrial Artificial Intelligence (INARI) Research Lab**
Research Assistant *Nov 2018 to Dec 2022*

- Research on unsupervised feature extraction for sequential data using a modified, restricted Boltzmann machine model. This project resulted in two publications.
- Worked on the design of a fast Multi-Object Tracking System for video, which is currently used by a retail brand in Ecuador, one of the laboratory funding companies. This project resulted in two publications.
- Took part in a project on Human Action Recognition through Pose estimation. The research was aimed towards robustness to camera angle variations.
- Led project to estimate conversion rates of retail stores using videos. This project can help estimate how many people who enter a store actually buy a product.
- Led project to calculate customer heatmaps from videos in a retail store. This project is used to better understand customer patterns and improve the layout of store facilities.

Escuela Superior Politécnica del Litoral **Industrial Engineering Bachelor**
Student *Apr 2014 to Oct 2019*

- Led a project to design a program that generates pricing policies and bus fleet schedules using integer linear programming for the university bus company (still used today). I developed a web interface for the program using Python and Django.
- Design a program that optimizes a congested traffic intersection in the university using discrete event-based simulation. I used the simulation software SUMO and some C++.
- My thesis was about measuring manual labor performance automatically using cameras. This project will be used to assess operational decisions and to understand the origin of time losses caused by delays and their impact on the activities in manual tasks. This project resulted in two publications.

PUBLICATIONS

- **Hernandez, J.**, Shi, J., Jenni, S., Ordonez, V., & Kafle, K. (2024). Improving Large Vision and Language Models by Learning from a Panel of Peers. Submitted to CVPR 2024.
- **Hernandez, J.**, Villegas, R., & Ordonez, V. (2024). Generative Visual Instruction Tuning. arXiv preprint arXiv:2406.11262. Submitted to ICLR 2024.
- **Hernandez, J.**, Villegas, R., & Ordonez, V. (2023). ViC-MAE: Self-Supervised Representation Learning from Images and Video with Contrastive Masked Autoencoders. ECCV 2024.
- Palacios, R., Piguave, B. V., **Hernandez, J.**, & Abad, A. G. (2023, October). Automatic Retail Dataset Creation with Multiple Sources of Information Synchronization. In 2023 Twelfth International Conference on Image Processing Theory, Tools and Applications (IPTA) (pp. 1-6). IEEE.
- Kim, J. W., **Hernandez, J.**, Cobos, R., Palacios, R., & Abad, A. G. (2022, May). A View Invariant Human Action Recognition System for Noisy Inputs. In 2022 19th Conference on Robots and Vision (CRV) (pp. 67-74). IEEE.
- **Hernandez, J.**, Valarezo, G., Cobos, R., Kim, J. W., Palacios, R., & Abad, A. G. (2021). Hierarchical Human Action Recognition to Measure the Performance of Manual Labor. IEEE Access, 9, 103110-103119.
- **Hernandez, J.**, G. Valarezo, S. Lopez and A. Abad, (2020) "Automatic time and motion study using Deep Learning" (Accepted).
- Cobos, R.,**Hernandez, J.**, & Abad, A. G. (2019, June). A fast multi-object tracking system using an object detector ensemble. In 2019 IEEE Colombian Conference on Applications in Computational Intelligence (ColCACI) (pp. 1-5). IEEE.
- Cobos R., **Hernandez, J.**, Abad A.G. (2019) Retail Traffic-Flow Analysis Using a Fast Multi-object Detection and Tracking System. In: Orjuela-Cañón A., Figueroa-García J., Arias-Londoño J. (eds) Applications of Computational Intelligence. ColCACI 2019. Communications in Computer and Information Science, vol 1096. Springer, Cham.
- **Hernandez, J.**, & Abad, A. G. (2018, May). Learning from multivariate discrete sequential data using a restricted Boltzmann machine model. In 2018 IEEE 1st Colombian Conference on Applications in Computational Intelligence (ColCACI) (pp. 1-6). IEEE.
- **Hernandez, J.**, & Abad, A. G. (2018, May). Spatial and Temporal Feature Extraction Using a Restricted Boltzmann Machine Model. In IEEE Colombian Conference on Applications in Computational Intelligence (pp. 3-13). Springer, Cham.

EDUCATION

- Ph.D student, Computer Science, Rice University, 2022-present.
- B.Sc., Industrial Engineering, Escuela Superior Politécnica del Litoral, 2014-2019.

TEACHING EXPERIENCE

- 2022 - Teaching Assistant for Deep Learning for Vision and Language.
- 2018 - Teaching Assistant for Integer Linear Programming.
- 2017 - Teaching Assistant for Operations Research.
- 2017 - Teaching Assistant for Advanced Statistics.
- 2016 - Teaching Assistant for Differential Equations.
- 2016 - Teaching Assistant for Multi-variable Calculus.

COMMUNITY SERVICE

- 2023 - Served as a mentor for the TaReCDa 2023 conference hosted in Machala, Ecuador.
- 2023 - Served as a mentor for the CVPR 2023 LXAI mentorship program.
- 2023 - Served as president of the Latin American Graduate Student Association at Rice University.
- 2019 - Served as a group mentor in a Machine Learning Hackathon. The group I advised ended third in the competition.
- 2019 - Served as a group mentor and challenge designer for my university programming Hackathon. The group I advised won the competition.
- 2018 - Gave free mentorship to students at my university. The topics included programming, calculus, and linear algebra.
- 2017 - Security process re-design for a children's hospital.
- 2014 - Volunteer at a nursing home and at a kindergarten.

TECHNICAL SKILLS

- **Machine Leaning Frameworks**: Proficient in: PyTorch, Jax, TensorflowV2, and Keras.
- **Machine Learning:** Vision and language models; Supervised, Self-Supervised, Unsupervised and Reinforcement Learning.
- **Modeling:** Statistical and mathematical systems, Markov decision processes, industrial processes.
- **Optimization:** Linear programming, Integer programming, genetic algorithms.
- **Data Analysis:** Probabilistic and Statistical Analysis, Big Data, Database Management.
- **Project Management:** Budget planning, Project planning, and Task management.
- **Programming:** Python, R, MATLAB, GAMS.

OTHER SKILLS

Software: LaTeX, MySQL, Django, Word, Excel, and PowerPoint, Minitab, AutoCAD, Inventor.
Languages: English: professional proficiency (104 TOEFL). Spanish: native.