BENJAMIN DOURTHE, PhD

Passionate Machine Learning Engineer | Innovator in Computer Vision | Team Leader

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Versatile and dedicated machine learning engineer with a decade of experience across diverse domains, specializing in cutting-edge technologies to drive innovative solutions. Recognized for spearheading the development of groundbreaking technologies. Strong leadership skills and a proven track record of delivering exceptional results through collaboration and effective team management.

By combining technical and domain expertise in machine learning, data analysis, programming and healthcare, I have achieved significant advancements in medical image analysis, automating complex processes and revolutionizing patient care. My passion for leveraging cutting-edge technologies, driving collaboration, and leading teams allows me to consistently deliver exceptional results.

TECHNICAL SKILLS

Machine Learning: Strong expertise in classification, regression, clustering, optimization, natural language processing, and deep learning techniques.
Data Analysis: Proficient in performing image/signal processing, time series analysis, computer vision, feature engineering, and statistical analysis using Python.
Programming: Extensive hands-on experience in Python frameworks like NumPy, Pandas, Scipy, OpenCV, Scikit-learn, TensorFlow, and PyTorch. Basic understanding of Matlab, R, SQL, and Git, with a strong desire to expand and apply these skills in future projects.
Interpersonal Skills: Strong leadership, project management, and team collaboration skills with a proven track record of successful projects. Excellent scientific writing and public speaking abilities in both English and French.

PROFESSIONAL EXPERIENCE

SENIOR MACHINE LEARNING ENGINEER at Nuralogix Corporation (Toronto, Canada), November 2022 - June 2023 (8-month contract)
• Spearheaded the development and optimization of more than 10 advanced signal processing and filtering algorithms, elevating video data quality by 25% and bolstering accuracy, performance, and generalization of machine learning models.
• Engineered an extensive array of over 100 signal-based features, thereby generating comprehensive and intricate high-dimensional representations of input video data.
• Developed and fine-tuned a machine learning pipeline, leveraging advanced methodologies such as hyperparameter optimization, cross-validation, and feature selection methods, to seamlessly classifies input video data and effectively identifies the most accurate regression model. This refined approach led to a remarkable 12% enhancement in biometric prediction performance.

CHIEF DATA OFFICER at Tidal Medical (Toronto, Canada), August 2020 - October 2022 (2 years and 3 months permanent position)
• Developed a non-invasive wearable system for monitoring pulmonary artery pressure in heart failure patients, achieving 97% accuracy compared to ground truth invasive measurements through the application of signal and image processing algorithms.
• Implemented a Super Resolution Generative Adversarial Network (SRGAN) to enhance the resolution of dynamic cross-sectional chest images while preserving clinically relevant details.
• Leveraged advanced signal processing techniques and cutting-edge deep learning methods for computer vision to optimize the software architecture, improving system efficiency by 90%.
• Led and managed the engineering team to develop a functioning beta prototype, hiring and overseeing two senior developers, two independent contractors, two academic partners, and two contracting firms to enable company growth.
• Directed the company's intellectual property strategies, filing 1 PCT and 4 provisional applications through the USPTO. Conducted detailed literature reviews and background research of analogous technologies to inform IP development.
• Managed $1.5M in capital and secured $700k in non-dilutive funding over a two-year period. Contributed to the creation of a comprehensive data room, including competitor analysis, literature review, product overview, and business strategy.

MACHINE LEARNING ENGINEER at University of British Columbia (Vancouver, Canada), June 2020 - December 2022 (2 years and 7 months post-doctoral contract)
• Developed and implemented advanced deep learning models to automate the segmentation and labeling of medical images, revolutionizing a previously time-consuming process. Notable achievements include the adaptation of a Multi-scale V-net, enabling automatic segmentation of spinal muscles with diverse morphology, shape, and size, as well as the implementation of a Universal Convolutional Neural Network (CNN) to extract the coordinates of vertebral body centroids from CT images.
• Through the utilization of these cutting-edge models, achieved a remarkable reduction in processing time from hours to mere seconds, delivering a substantial boost to data analysis efficiency. This breakthrough advancement greatly empowered clinicians in generating tailored and effective treatment plans, significantly elevating the potential for successful outcomes in patient care.

COMPUTER VISION ENGINEER at Sunnybrook Research Institute (Toronto, Canada), December 2018 - June 2020 (1 year and 7 months post-doctoral contract)
• Collected and analyzed data using a diverse range of motion capture technologies, including infrared cameras with retroreflective markers (gold standard), marker-less infrared depth sensors, as well as standard RGB cameras powered by deep learning.
• Developed a custom deep learning model based on the Mask RCNN architecture, which was retrained using transfer learning techniques for the accurate detection and tracking of 24 body segments from 2D videos. Achieved great performance compared with gold standard 3D marker-based technology.
• Implemented a robust deep learning solution utilizing a Recurrent Neural Network (RNN) with Long Short-Term Memory (LSTM) units to define a transfer function. This transfer function effectively learned from gold standard motion tracking data, resulting in a remarkable 35% improvement in accuracy for marker-less motion tracking systems.

DATA SCIENTIST at University of Calgary (Calgary, Canada), October 2017 - November 2018 (1 year and 2 months post-doctoral contract)
• Collaborated with prominent companies such as Adidas, Dr. Scholl's, and various startups to evaluate the impact of apparel and footwear on human performance and fatigue. Designed and implemented comprehensive data processing platforms to facilitate the efficient handling, analysis, and visualization of extensive datasets.
• Collected, processed, and analyzed data from diverse sensor sources, including pressure sensors, inertial measurement units (IMUs), electromyography (EMG), 3D contact-less scanners, and mechanical testing equipment.
• Applied advanced signal processing techniques and statistical tools to gain insights and quantitatively assess the impact of each intervention. Generated detailed reports for corporate partners, providing valuable recommendations based on the analysis results.

RESEARCH ENGINEER at KU Leuven (Leuven, Belgium), April 2014 - June 2017 (3 years and 3 months graduate contract)
• Conducted groundbreaking graduate research focusing on the development of patient-specific models to predict the onset of degenerative musculoskeletal conditions using medical images.
• Developed and implemented protocols to collect medical imaging data from both patients with degenerative musculoskeletal conditions and healthy individuals. These data served as the foundation for the creation of comprehensive 3D mapping technologies.
• Designed sophisticated image processing algorithms to automate the extraction of patient-specific morphological data from imaging technologies, which played a crucial role in accurately predicting the distribution of mechanical stress in human joints.
• Leveraged the extracted data and predictions to generate insights about the location of future degenerations. This knowledge facilitated the development of tailored preventative and treatment measures, ensuring a more personalized approach to patient care.

EDUCATION

• **PhD in Biomedical Engineering**, KU Leuven, Leuven, Belgium, April 2014 - June 2017
• **Visiting Scholar**, University of British Columbia, Vancouver, Canada, October 2016 - November 2016
• **Visiting Scholar**, University of Southern California, Los Angeles, USA, August 2015 - December 2015
• **MSc in Science, Technology and Health**, University of Lorraine, Metz, France, September 2012 - June 2013
• **MSc in Mechanical Engineering**, National Engineering School of Metz (ENIM), Metz, France, September 2008 - June 2013

ACHIEVEMENTS

• **Recognition:** over 25 awards for outstanding academic performance and high-quality research, totaling over $1.5 million in funding.
• **Publications:** over 30 peer-reviewed articles, industry reports, and conference presentations showcasing expertise in various fields.

SIDE PROJECTS

• Developed a natural language processing model that leveraged a Naïve Bayes classifier to accurately classify news articles. Achieved 94% of correct predictions.
• Built a support vector machine model that predicted individuals at risk of developing coronary heart disease, leveraging the synthetic minority oversampling technique (SMOTE) to compensate for class imbalance and reduce type II error by 84%.
• Implemented an algorithm enabling the automated detection and tracking of faces on images and videos using the functionality of Haar cascades and several tracking APIs.
• Applied the concepts of Dense Optical Flow as well as the functionality of the Gunnar Farneback's algorithm to automatically detect and quantify motion from video data.
• Created a computer vision pipeline using the YOLO algorithm combined with transfer learning techniques to track and detect objects from images and videos with high accuracy.
• Developed a notebook with detailed instructions enabling developers to harness the power of the Llama 2 large language model locally for text generation purposes.