

# Shrishailya Chavan

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## EDUCATION

|  |                                       |
|--|---------------------------------------|
| <b>Worcester Polytechnic Institute - Worcester, MA</b><br><i>Masters in Mechatronics, Robotics and Automation Engineering</i><br><b>Relevant Coursework:</b> Deep Learning, Machine Learning, Computer Vision, Reinforcement Learning, Medical Robotics, Motion Planning, Controls | Aug 2022 - May 2024<br>GPA: 4.0/4.0   |
| <b>Vishwakarma Institute of Technology - Pune, India.</b><br><i>Bachelor of Technology in Mechanical Engineering</i>   | Aug 2018 - July 2022<br>CGPA: 8.65/10 |

## TECHNICAL SKILLS

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|---|---|
| <b>Programming Languages:</b> C++, Python, ROS, MATLAB, Lua   | <b>CAE Software:</b> Ansys                              |
| <b>Deep Learning Frameworks:</b> TensorFlow, PyTorch, Keras   | <b>Other Software:</b> CoppeliaSim, Gazebo, Scilab Xcos |
| <b>Programming Libraries:</b> Pandas, NumPy, Scikit-learn, CUDA, OpenCV, seaborn, GDAL, SciPy   | <b>Databases:</b> MSSQL, MySQL                          |
| <b>Tools:</b> PyTest  | <b>Platforms:</b> Amazon Web Services (AWS)             |
| <b>CAD Software:</b> SOLIDWORKS, AutoCAD, CATIA, Fusion360, 3DEXPERIENCE  | <b>Configuration Management:</b> Git                    |
| <b>Deep Learning Architectures:</b> ResNET, ResNEXT, DenseNET, VGG16, HomographNET, Sfm Learner, U-Net, Filter Banks (Oriented DoG, Leung-Malik, Gabor, Texton, Brightness, Color map, Sobel and Canny baselines) |   |

## PROFESSIONAL EXPERIENCE

|   |                              |
|---|------------------------------|
| <b>Dassault Systemès, Johnston, RI</b> ( <i>Machine Learning Research Intern</i> )<br>Innovative AI Chatbot Development for SIMULIA User Assistance ( <b>widgets, Generative AI, RAG, LLMs, Fine-Tuning and Research</b> ) <ul style="list-style-type: none"><li>Designed and implemented an <b>advanced AI LLM Chatbot specific to Dassault Systemès</b> utilizing the RAG (Retrieval-Augmented Generation) system, LangChain Streamlit to revolutionize SIMULIA User Assistance.</li><li>Fine-tuned the translation feature within the AI Chatbot, achieving a remarkable level of <b>precision in delivering accurate translations</b>.</li><li><b>Impactful efficiency improvement</b> by enabling the User Assistance team to seamlessly communicate and address customer doubts in different languages.</li></ul> <b>Dassault Systemès Knowledge GPT (CATIA AI Team, RAG, Prompt Engineering, MLOps and Research)</b> <ul style="list-style-type: none"><li><b>Developed Dassault Systemès Knowledge GPT and integrated</b> it seamlessly into the company's ecosystem, offering users a sophisticated tool to retrieve information without navigating extensive documentation across many products.</li><li>Implemented a <b>user-friendly GUI</b> using LangChain, Chainlit, and Streamlit, ensuring an intuitive and accessible interface for users seeking answers from the knowledge base.</li><li>Significantly optimized user efficiency by <b>eliminating the need for manual exploration of documentation comprising of images, text, videos</b>, allowing quick and direct access to relevant and precise information.</li></ul>  | <b>Oct 2023 - Ongoing</b>    |
| <b>Triple Ring Technologies, Boston, MA</b> ( <i>Machine Learning Research Intern</i> )<br>ChemGPT- Chemical Chat Generative Pre-Trained Transformers <ul style="list-style-type: none"><li>Developed a <b>real-time chemical query chatbot leveraging LLM</b> for inquiries on molecular densities, chemical names, formulas, and abbreviations. <b>Created and managed</b> a comprehensive chemical <b>database</b> comprising <b>2 million rows</b>.</li><li>Data Collection: Used <b>APIs and web scraping</b> to gather raw chemical data.</li><li>Data Processing: Employed advanced techniques like <b>cleaning, normalization, and tokenization</b> to prepare data for integration into the database.</li><li>Employing LLM: Leveraged MarkupLM (an LLM variant) for <b>enhanced HTML data extraction</b>, complemented with NLP for proficient query handling.</li><li>Programming &amp; Deployment: Utilized languages and libraries such as Python, Java, and NumPy to build, test, and deploy the system.</li><li>Continuous Learning: Kept <b>abreast with the latest NLP and LLM advancements</b>, and <b>presented working prototypes demonstrating</b> the applied solutions.</li><li>The <b>LLM-powered chatbot drastically streamlined</b> chemical data inquiries, reducing extensive manual search time to mere seconds. The database I built became a pivotal resource, offering accurate and swift chemical information retrieval.</li></ul> <b>Deep Learning Acceleration of CT Dosimetry Simulations for Medical Devices</b> <ul style="list-style-type: none"><li>Developed the MCDNet, a neural network to <b>accelerate Monte Carlo simulations for medical devices</b> CT dosimetry, addressing x-ray CT radiation concerns.</li><li>Leveraged anatomical voxel phantoms and a <b>GPU-based</b> Monte Carlo code for data generation. <b>Assessed predicted dose maps</b> using the Gamma index passing rate (GIPR).</li><li><b>Achieved a 76× speed-up in simulations</b>, introducing a novel use of CNN for MC radiation simulations with 3D medical devices for x-ray CT. Future potential for broader radiation transport applications.</li></ul> <b>Predictive ML Modeling for Radiation Sterilization Dosimetry in Medical Devices</b> <ul style="list-style-type: none"><li>Developed a <b>Machine Learning based predictive tool</b> for radiation dose mapping in medical device sterilization.</li><li>Reviewed relevant sterilization literature. <b>Utilized CAD models</b> for initial dose predictions. Designed and <b>trained an ML model</b> using custom radiation simulations, data preprocessing techniques, including cleaning, normalization, and tokenization. <b>Streamlined the process</b> through documentation and application of best practices.</li><li>Streamlined sterilization validation, reducing traditional inefficiencies. Facilitated early-stage design decisions for optimal sterilizability. <b>Enhanced simulation prediction speed, optimizing the product development cycle</b>.</li></ul> | <b>June 2023 - Sept 2023</b> |
| <b>Medical Fusion Lab, WPI, Worcester, MA</b> ( <i>Graduate Student Researcher</i> )<br>Tumor boundary extraction from Photo-acoustic prostate imaging <ul style="list-style-type: none"><li>Processed tumor ultrasound data, <b>trained a U-Net model</b> for mask prediction, conducted 3D tumor reconstruction, and applied <b>advanced visualization and morphological techniques</b> to the predicted data.</li><li>Extracted frames from tumor videos, performed <b>binary segmentation</b> in MATLAB, and trained a U-Net model on the resulting dataset. Utilized the <b>predicted masks for 3D tumor reconstruction in MATLAB</b> and employed FIJI visualization and morphological operations for refined analysis.</li></ul>   | <b>Nov 2022 - April 2023</b> |

- Approach enhanced tumor morphology understanding, potentially **improving diagnosis and treatment planning**. Visualization and morphological operations provided **comprehensive tumor analysis**, supporting future oncology research and clinical applications.

[HERB-Lab](#), WPI, Worcester, MA (*Graduate Student Researcher*)

Nov 2022 - April 2023

Classification of thermal anomalies using deep learning and **Vision Transformers (ViT)** to Convolutional neural networks (CNNs)

- [Web Scrapped](#) and collected the data for image facades and labelled them.
- Working on **Masked Image Modeling** to understand architecture age and style through Deep Learning.

## ACADEMIC PROJECTS

- [Einstein Vision](#) April 2023
  - Developed an **advanced autonomous vehicle dashboard visualization system** with essential features, advanced capabilities, and extra cognitive abilities.
  - Utilized **pre-trained computer vision models, depth estimation, pose estimation, and creative techniques** like color thresholding to identify and render various elements in the scene **using Blender**.
  - Visualization system **improved human-robot interaction**, trust-building and enabled better decision-making for the autonomous vehicle, enhancing user experience and safety.
- [Visual Inertial Odometry](#) April 2023
  - Applied the "Robust Stereo Visual Inertial Odometry for Fast Autonomous Flight" paper on the EuRoC dataset's Machine Hall 01 subset. This dataset consists of **quadrotor trajectory data** with ground truth from a Vicon Motion capture system.
  - Developed a deep learning approach for **stereo SLAM** (Simultaneous Localization and Mapping) by predicting relative pose between image frames and IMU measurements. Trained the neural network on the **EuRoC dataset's**. Compared the performance of vision-only, inertial-only, and visual-inertial data predictions.
  - Resulting **stereo visual-inertial fusion system** enables fast autonomous robot navigation in challenging environments. The combination of classical and deep learning approaches improves stereo **camera pose estimation accuracy** and **handles** common issues like **motion blur and drift**. This technology has significant implications for **advanced robotics, particularly in aerial robotics and autonomous vehicles**.
- [Auto Pano](#)
  - Panorama **image stitching** using traditional and deep learning approach to find homography between two images.
  - Implemented traditional CV pipeline combines algorithms of **corner detection, ANMS, feature extraction, feature matching, RANSAC, homography estimation and blending**.
  - In Deep Learning, used **Homography Net** (both supervised and unsupervised) to estimate the homography.
- [Building built in Minutes - SfM and NeRF](#)
  - Reconstructed a 3D scene and simultaneously obtained the camera poses of a monocular camera from a set of images with different view points using feature point correspondences (classical CV).
  - Implemented pipeline consisted of algorithms to find **Fundamental and Essential Matrix, triangulation of 3D points** (using Epipolar geometry), Perspective-N-Point (3D-2D PnP) and **Bundle adjustment**.
  - Used Neural Radiance fields (NeRF) to synthesize novel views of complex scenes by optimizing a continuous volumetric scene function using a sparse set of input views (Deep Learning).
- [Auto Calib](#) : Implemented **Zhang's camera calibration** technique with non-linear optimization.
- [Factored Solution to the Simultaneous Localization and Mapping\(SLAM\) Problem with Unknown Data Association](#) Jan 2023
  - Developed and implemented the **FastSLAM algorithm**, a novel approach addressing SLAM limitations in **EKF-based methods**.
  - Introduced **FastSLAM 2.0**, incorporating observations into the **proposal distribution for diverse samples and improved accuracy**.
  - **Achieved superior performance** in large, ambiguous environments with **fewer samples**, enabling effective people tracking in **dynamic scenarios**.
- [Language Translator using Seq2Seq Model\(RNN\)](#), *Python, Keras* Sept 2022

Build and devise a high performing machine translation sequence to sequence model(RNN) that will accept English text as input and return the French translation

  - Supervised **model development, processing of text data** to feed it to the network pipelines, testing and validation of translated output text streams.
  - Developed a **Recurrent Neural Network and fully-connected layer** to accept and process the sequence of words respectively.