

# Anar Nurizada

## Education

- Jan 2021 – Present **Ph.D. in Mechanical Engineering, Minor in Computer Science**, *Stony Brook University*, NY, USA, GPA: 3.71.
- Jan 2020 – Dec 2020 **M.S. in Mechanical Engineering**, *Stony Brook University*, NY, USA, GPA: 3.82.

## Experience

- Sep 2020 – Present **Graduate Research Assistant**, *Stony Brook University*, Stony Brook, NY.
- Designed four multi-modal generative models for path synthesis in mechanical engineering:
    - Transformer-based model with LLaMa2 features and MLP for mechanism type prediction.
    - Conditional beta VAE with cross-attention mechanisms, integrated conditions, and Classifier Free Guidance.
    - Conditional graph-VAE model with Classifier Free Guidance.
    - Image-based VAE and MLP for mapping between latent space and mechanism representation.
  - Implemented object detection algorithms and post-processing techniques for sketch conversion by fine-tuning YOLOv4.
  - Led end-to-end research projects, including dataset creation, data preprocessing, model validation, and augmentation.
  - Demonstrated deep expertise in neural network architectures, loss functions, and data manipulation tools including PyTorch (Lightning), NumPy, SciPy, Matplotlib, and scikit-learn.
  - Managed dataset updates via Kaggle and utilized online GPU services (Lambda, VAST.AI). Worked with Linux, CUDA and presented work at annual ASME conferences in 2021 - 2023.
- Oct 2019 – Dec 2020 **Mechanical Engineer Intern**, *Flower Turbines LLC*, Stony Brook, NY.
- Modeled wind turbines' interactions with rooftops through advanced simulations, enhancing reliability and performance.
  - Conducted comprehensive cost-benefit analysis for data-driven project profitability and sustainability decisions.
  - Validated structural integrity of designs with rigorous wind load simulations using Ansys.
  - Designed novel rooftop installations for wind turbines with Autodesk Inventor CAD.
- Jun 2019 – Sep 2019 **Summer Mechanical Engineer Intern**, *BP*, Baku, Azerbaijan.
- Supported onshore operations for seamless project execution with contractors.
  - Expert in materials management, coordination, and standards compliance.
  - Oversaw valve sizing, certification, and repairs to enhance efficiency and safety.
  - Led piping design and stress analysis to optimize installations and improve structural integrity.
- Sep 2018 – May 2020 **Undergraduate Research Assistant**, *Stony Brook University*, Stony Brook, NY.
- Explored 3D printed part anisotropy with size effect methods, enhancing materials science research.
  - Created accurate test specimens via advanced 3D printing and modeling.
  - Performed detailed 3-point bending tests using Instron equipment and analyzed data.
  - Skilled in piping design, stress analysis, and optimizing installations for better performance and integrity.

## Publications

- 2024 **Nurizada, A.**, Dhaipule, R., Lyu, Z., Purwar, A.. "A Dataset of 3M Single-DOF Planar 4-, 6-, and 8-bar Linkage Mechanisms with Open and Closed Coupler Curves for Deep Generative Path Synthesis." *ASME JMD*. Under review.
- 2024 **Nurizada, A.**, Lyu, Z., Purwar, A.. "Path Generative Model based on Conditional  $\beta$ - Variational Auto Encoder for Mechanism Design." *ASME JMR*. Under review.
- 2024 **Deng, X., Nurizada, A.**, Purwar, A.. "Synthesizing Spatial RSCR Mechanisms for Path Generation using a Deep Neural Network." *Frontiers of Mechanical Engineering*. Under review.
- 2023 **Nurizada, A.**, Purwar, A.. "An invariant representation of coupler curves using a variational AutoEncoder: Application to path synthesis of four-bar mechanisms." *ASME JCISE*, doi:10.1115/1.4063726.
- 2022 **Nurizada, A.**, Purwar, A.. "Transforming hand-drawn sketches of linkage mechanisms into their digital representation." *ASME JCISE*, doi:10.1115/1.4064037
- 2021 **Nurizada, A.**, Kirane, K.. "Induced anisotropy in the fracturing behavior of 3d printed parts analyzed by the size effect method." *Engineering Fracture Mechanics*, 239, 107304. doi:<https://doi.org/10.1016/j.engfracmech.2020.107304>

## Graduate Courses

- CompSci Machine Learning, Computational & Data Science, Computer Vision, Probability and Statistics, Computer-Aided Design of Shapes and Motion.
- MechE Mathematical & Numerical Methods in Engineering, Energy Technologies Lab I & II, Robotics: Theory and Applications, Advanced Dynamics, Vibration and Control, Finite Element Methods, Control System Analysis and Design.