<!DOCTYPE HTML>

<html lang="en"><head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8">

<title>Syed Muhammad Talha Zaidi</title>

<meta name="author" content="Jon Barron">

<meta name="viewport" content="width=device-width, initial-scale=1">

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<link href="https://cdn.jsdelivr.net/npm/bootstrap@5.3.1/dist/css/bootstrap.min.css" rel="stylesheet" integrity="sha384-4bw+/aepP/YC94hEpVNVgiZdgIC5+VKNBQNGCHeKRQN+PtmoHDEXuppvnDJzQIu9" crossorigin="anonymous">

<!--<link rel="icon" href="data:image/svg+xml,<svg xmlns=%22http://www.w3.org/2000/svg%22 viewBox=%220 0 100 100%22><text y=%22.9em%22 font-size=%2290%22>🌐</text></svg>"> -->

<!--<script src="https://cdn.jsdelivr.net/npm/particles.js@2.0.0/particles.min.js"></script>

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height: 100%;

overflow: hidden;

}

#particles-js {

position: absolute;

width: 100%;

height: 100%;

top: 0;

left: 0;

z-index: -1;

}

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<div id="particles-js"></div>

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<nav class="navbar sticky-top navbar-expand-lg bg-body-tertiary">

<div class="container-fluid">

<!-- <a class="navbar-brand" href="#">Navbar</a> -->

<button class="navbar-toggler" type="button" data-bs-toggle="collapse" data-bs-target="#navbarNavDropdown" aria-controls="navbarNavDropdown" aria-expanded="false" aria-label="Toggle navigation">

<span class="navbar-toggler-icon"></span>

</button>

<div class="collapse navbar-collapse" id="navbarNavDropdown">

<ul class="navbar-nav ms-auto">

<li class="nav-item">

<a class="nav-link active" aria-current="page" href="#">Introduction</a>

</li>

<li class="nav-item">

<a class="nav-link" href="#Research">Research</a>

</li>

<li class="nav-item">

<a class="nav-link" href="#work">Work Experience</a>

</li>

<li class="nav-item">

<a class="nav-link" href="#FundedProjects">Funded Projects</a>

</li>

</ul>

</li> -->

</ul>

</div>

</div>

</nav>

</div>

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<tr style="padding:0px">

<td style="padding:2.5%;width:63%;vertical-align:middle">

<p style="text-align:center">

<name>Syed Muhammad Talha Zaidi</name>

</p>

<p align="justify"> I am a Ph.D. Candidate in Computer Science at <a href="https://www.k-state.edu/" target="\_blank">Kansas State University</a>, advised by <a href="https://munir.iscaaslab.com/" target="\_blank">Arlsan Munir</a>. I am a member of the <a href="https://iscaaslab.com/" target="\_blank">ISCAAS Lab</a> and my area of research is generative AI and reinforcement learning.

Previously, I obtained an M.S. from Istanbul Medipol University and completed my B.S in Mechatronics and Controls Engineering from UET Lahore.

<p>

If you would like to collaborate on a research idea, please send me an email. I am very enthusiastic about collaborations and open-source projects. I also mentor students who are seeking graduate school in the U.S, or are just excited about doing research.

<p>

<p> <strong>Top skills:</strong> <br> Reinforcement Learning, Machine Learning, Generative AI, Diffusion Models.</p>

<p style="text-align:center">

<a href="mailto:tzaidi@ksu.edu" target="\_blank">Email</a> &nbsp/&nbsp

<a href="https://www.linkedin.com/in/tzaidi13/" target="\_blank">Linkedin</a> &nbsp/&nbsp

<a href="https://github.com/talhazaidi13" target="\_blank">GitHub</a> &nbsp/&nbsp

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en target="\_blank">Google Scholar</a> &nbsp

</p>

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<td style="padding:2.5%;width:40%;max-width:40%">

<a href="images/talha.JPG"><img style="width:80%;max-width:100%;float: right;" alt="profile photo" src="images/talha.JPG" class="hoverZoomLink"></a>

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<!--###########################################################################################################################################################################################-->

<br><br id="Research">

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<tr>

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<heading > Research </heading>

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<td style="padding:2.5%;width:63%;vertical-align:middle; text-align: justify;">

I am passionate about applying reinforcement learning (RL) to address complex, real-world challenges. My research focuses on developing advanced RL methodologies to improve policy consistency and mitigate distributional shifts in offline settings. I work on optimizing RL-based security protocols for smart grids to enhance communication and authentication resilience. Additionally, I design novel RL algorithms for spacecraft trajectory optimization, aiming to improve decision-making and efficiency in space missions. My work is driven by the goal of creating robust, practical RL solutions that can make a significant impact across diverse applications.

<br>

<br>

<p style="white-space: pre-line;"></p>

<p style="white-space: pre-line;"></p>

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<td style="padding-left:1px;padding-top:30px;width:20%;vertical-align:top">

<div class="one">

<img src='images/diff.PNG' width="170" alt="Geocentric orbital Transfer">

</div>

</td>

<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Conservative Q-Learning through Diffusion Generative Models </h6>

<i>Ongoing Project </i> <br>

<p style="text-align: justify;">

Aim of this project is to mitigate distributional shift between behavioral and learned policies, using diffusion probabilistic models to enhance policy consistency and reduce out-of-distribution actions. </p>

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Optimized PKC and DRL-Based Security Protocols for Smart Grids </h6>

<i>Ongoing Project </i> <br>

<p style="text-align: justify;">

Developing optimized public key cryptography (PKC) security protocols and reinforcement learning (RL)-based security mechanisms to enhance secure communication, authentication, and resiliency in smart grid systems. </td>

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<img src='images/NRHO\_SGTO.gif' width="170" alt="SA3C Algorithm">

</div>

</td>

<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Single-Agent Attention Actor-Critic (SA3C): A Novel RL based Solution for Low-Thrust Spacecraft Trajectory Optimization</h6>

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://www.researchgate.net/profile/Adrian-Arustei" target="\_blank"><font color="gray">Adrian Arustei</font></a> ,

<a href="https://scholar.google.ca/citations?hl=en&user=-P9waaQAAAAJ&view\_op=list\_works&sortby=pubdate" target="\_blank"><font color="gray">Arslan Munir</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=-Ewv\_iEAAAAJ" target="\_blank"><font color="gray">Atri Dutta</font></a>

<br> <i>Submitted in IEEE Transaction on Aerospace and Electronic Systems</i> <br>

<p style="text-align: justify;">

Developed the Single-Agent Attention Actor-Critic (SA3C) algorithm, enhancing decision-making and sample efficiency in low-thrust spacecraft trajectory optimization using deep reinforcement learning (DRL). Applied to geocentric and cislunar missions, SA3C outperforms traditional methods in complex multi-body orbital dynamics.

</p>

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<div class="one">

<img src='images/singleSAC.JPG' width="170" alt="Geocentric orbital Transfer">

</div>

</td>

<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Automated Trajectory Planning: A Cascaded Deep Reinforcement Learning Approach for Low-Thrust Spacecraft Orbit-Raising</h6>

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://www.researchgate.net/profile/Adrian-Arustei" target="\_blank"><font color="gray">Adrian Arustei</font></a> ,

<a href="https://scholar.google.ca/citations?hl=en&user=-P9waaQAAAAJ&view\_op=list\_works&sortby=pubdate" target="\_blank"><font color="gray">Arslan Munir</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=-Ewv\_iEAAAAJ" target="\_blank"><font color="gray">Atri Dutta</font></a>

<br> <i>Submitted in IEEE Magazine on Aerospace and Electronic Systems</i> <br>

<p style="text-align: justify;">

Developed a novel Cascaded Deep Reinforcement Learning (CDRL) approach to optimize low-thrust spacecraft trajectory planning, significantly improving time-efficient orbit transfers. Achieved superior performance over traditional methods in complex multi-body environments for transfers to GEO and NRHO.

</p>

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<img src='images/GTO-GEO.gif' width="170" alt="CDRL">

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Cascaded Deep Reinforcement Learning-Based Multi-Revolution Low-Thrust Spacecraft Orbit-Transfer</h6>

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=7UJBXYgAAAAJ" target="\_blank"><font color="gray">P.S. CHADALAVADA</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=xnXPj0UAAAAJ" target="\_blank"><font color="gray">Hayat Ullah</font></a>,

<a href="https://scholar.google.ca/citations?hl=en&user=-P9waaQAAAAJ&view\_op=list\_works&sortby=pubdate" target="\_blank"><font color="gray">Arslan Munir</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=-Ewv\_iEAAAAJ" target="\_blank"><font color="gray">Atri Dutta</font></a>

<br>

<em>IEEE Access 11</em>,(2023): 82894-82911. &nbsp <!-- <font color="red"><strong>(Oral Presentation)</strong></font> -->

<br>

<a href="https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=10207710" target="\_blank">Paper</a>

<a href="https://github.com/talhazaidi13/Cascaded-Deep-Reinforcement-Learning-Based-Multi-Revolution-Low-Thrust-Spacecraft-Orbit-Transfer" target="\_blank">Code</a>

<p style="text-align: justify;">

Developed a Cascaded Deep Reinforcement Learning (DRL) model for optimizing long-duration, low-thrust spacecraft transfers from GTO to GEO. This approach, guided by a gradient-aided reward function, significantly reduces transfer time compared to state-of-the-art methods, enhancing spacecraft autonomy in complex multi-revolution transfers.

</p>

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<img src='images/bmvc4.png' height="170" width="170" alt="Geocentric orbital Transfer">

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Mode-Guided Feature Augmentation for Domain Generalization </h6>

<a href="https://scholar.google.com/citations?hl=en&user=ZgERfFwAAAAJ" target="\_blank"><font color="gray">Muhammad Haris Khan</font></a>,

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=M59O9lkAAAAJ" target="\_blank"><font color="gray">Salman Khan</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=zvaeYnUAAAAJ" target="\_blank"><font color="gray">Fahad Shehbaz Khan</font></a>,

<br>

<em>In British Machine Visiion Conference BMVC .</em>,(p. 176) <!-- <font color="red"><strong>(Oral Presentation)</strong></font> -->

<br>

<a href="https://www.bmvc2021-virtualconference.com/conference/papers/paper\_0757.html" target="\_blank">Paper</a>

<p style="text-align: justify;">

Proposed a simple and efficient domain generalization (DG) approach that augments source domains by exploring dominant modes of variation in the feature space, enhancing generalization to unseen domains. Demonstrated competitive performance against state-of-the-art methods on popular DG benchmarks, including challenging single-source settings.

</p>

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<img src='images/NASA.JPG' height="170" width="170" alt="Geocentric orbital Transfer">

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Machine Learning Assisted Low-Thrust Orbit-Raising: A Comparative Assessment of a Sequential Algorithm and Deep Reinforcement Learning Approach </h6>

<a href="https://scholar.google.com/citations?hl=en&user=-Ewv\_iEAAAAJ" target="\_blank"><font color="gray">Atri Dutta</font></a>,

<a href="https://www.researchgate.net/profile/Adrian-Arustei" target="\_blank"><font color="gray">Adrian Arustei</font></a> ,

<a <font color="gray">Matthew Chace </font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=7UJBXYgAAAAJ" target="\_blank"><font color="gray">P.S. CHADALAVADA</font></a>,

<a<font color="gray">James Steck</font></a>,

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=-Ewv\_iEAAAAJ" target="\_blank"><font color="gray">Atri Dutta</font></a>

<br>

<em>AIAA SCITECH 2024 Forum.</em>,1669 <!-- <font color="red"><strong>(Oral Presentation)</strong></font> -->

<br>

<a href="https://arc.aiaa.org/doi/abs/10.2514/6.2024-1669" target="\_blank">Paper</a>

<p style="text-align: justify;">

Developed a machine-learning-assisted method for optimizing low-thrust orbit-raising trajectories, integrating a sequential algorithm with a neural network-based high-level planner, and benchmarked it against deep reinforcement learning approaches for geostationary and halo orbit missions. </td>

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<img src='images/LANL.JPG' height="170" width="170" alt="Geocentric orbital Transfer">

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">Learned vs. Hand-Crafted Features for Deep Learning Based Aperiodic Laboratory Earthquake Time-Prediction </h6>

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=qHO7QtEAAAAJ" target="\_blank"><font color="gray">Asmaa Samy</font></a> ,

<a href="https://scholar.google.com/citations?hl=en&user=nzL9Tq0AAAAJ" target="\_blank"><font color="gray">Mehmet Kocatürk</font></a>,

<a href="https://scholar.google.com/citations?hl=en&user=4YHgEJQAAAAJ" target="\_blank"><font color="gray">Hasan F. Ateş</font></a>

<br>

<em>2020 28th signal processing and communications applications conference (SIU) .</em>,(p. 1-4) 2020/10/5 <!-- <font color="red"><strong>(Oral Presentation)</strong></font> -->

<br>

<a href="https://ieeexplore.ieee.org/abstract/document/9302474" target="\_blank">Paper</a>

<p style="text-align: justify;">

Developed and evaluated machine learning models for earthquake prediction using LANL data, demonstrating that a CNN-LSTM network significantly outperformed traditional methods, providing faster and more accurate predictions compared to existing approaches in the literature. </p>

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<img src='images/MTRX.gif' width="170" alt="Geocentric orbital Transfer">

<img src='images/MTRX1.JPG' width="170" alt="Geocentric orbital Transfer">

</div>

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<td style="padding-left:20px;padding-top:20px;width:80%;vertical-align:top">

<h6 style="text-align: justify;">A behavioral paradigm for cortical control of a robotic actuator by freely moving rats in a one-dimensional two-target reaching task </h6>

<a href="https://scholar.google.com/citations?user=zshykwYAAAAJ&hl=en" target="\_blank"><font color="black">S.M.T. Zaidi</font></a>,

<a <font color="gray">Samet Kocatürk </font></a>,

<a <font color="gray">Tunçer Baykaş </font></a>

<a href="https://scholar.google.com/citations?hl=en&user=nzL9Tq0AAAAJ" target="\_blank"><font color="gray">Mehmet Kocatürk</font></a>,

<br>

<em>Journal of Neuroscience Methods .</em>,373, 109555 <!-- <font color="red"><strong>(Oral Presentation)</strong></font> -->

<br>

<a href="https://www.sciencedirect.com/science/article/pii/S0165027022000826" target="\_blank">Paper</a>

<p style="text-align: justify;">

Developed a novel behavioral paradigm for controlling neuroprosthetic trajectories in rats, adapting a one-dimensional setup for reaching two distant targets. This method, utilizing primary motor cortex activity to direct robotic actions, achieved over 78% accuracy in target reaching and demonstrated the potential for reversal learning. This work represents the first successful implementation of trajectory-based neuroprosthetic control in rodents, offering a cost-effective platform for exploring neural circuit principles and novel brain-machine interface technologies. </td>

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<img src='images/kstate.png' width="100">

<br><a href="https://www.k-state.edu/" target="\_blank"><small>Kansas State University</small></a><small><br> Graduate Teaching Assistant <br> Aug. 2021 - Dec. 2022

<br> CIS 530/730 (Introduction to AI), & <br> CIS: 209A/B (Computer Programming)

</small>

</td>

<td style="padding:5px;width:33%;vertical-align:middle;text-align: center;">

<img src='images/iscaas.png' width="90">

<br><a href="https://iscaaslab.com/" target="\_blank"><small>ISCAAS Lab</small></a><small><br> Graduate Research Assistant <br> Jan. 2023 - Current

<br><a href="https://iscaaslab.com/artificial-intelligence-assisted-spacecraft-trajectory-optimization-and-planning/" target="\_blank"><small>NASA AI Project</small></a><small>

<br><a href="https://iscaaslab.com/pkc-and-puf-based-authentication-and-secret-key-establishment-in-smart-grid/" target="\_blank"><small>DOE Security Project</small></a><small>

</small>

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<td style="padding:5px;width:33%;vertical-align:middle;text-align: center;">

<img src='images/medipol.png' width="92">

<br><a href="https://sens.medipol.edu.tr/graduate/" target="\_blank"><small>Istanbul Medipol University</small></a><small>

<br><a href="https://nrg.medipol.edu.tr/?page\_id=2287" target="\_blank"><small>Neuroprosthetics Lab</small></a><small></small>

<br> Graduate Research Assistant <br> Oct. 2018 - Dec. 2020

</td>

<td style="padding:5px;width:33%;vertical-align:middle;text-align: center;">

<img src='images/tetrapak.png' width="92">

<br><a href="https://www.tetrapak.com/en-pk" target="\_blank"><small>Tetrapak</small></a> <small> <br> Field Engineer <br> Apr. 2016 - June. 2018</small>

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<tr>

<td style="width:100%;vertical-align:middle">

<heading>Funded Projects</heading>

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<td style="padding:2.5%;width:63%;vertical-align:middle;text-align:justify;">

<strong>Optimized PKC and DRL-Based Security Protocols for Smart Grids:</strong>

<p>Developing optimized public key cryptography (PKC) security protocols and reinforcement learning (RL)-based security mechanisms to enhance secure communication, authentication, and resiliency in smart grid systems. This project is funded by the Department of Energy, US. (<a href="https://iscaaslab.com/pkc-and-puf-based-authentication-and-secret-key-establishment-in-smart-grid/">link</a>)</p>

<strong>Deep Reinforcement Learning Assisted Spacecraft Trajectory Optimization and Planning:</strong>

<p>Developed a novel attention-based Single-Agent Actor-Critic (SA3C) algorithm for optimizing low-thrust spacecraft trajectories, outperforming traditional RL algorithms in geocentric and cislunar missions. This work resulted in three publications (2 submitted, 1 published), enhancing sample efficiency and decision-making in complex orbital dynamics. It is funded by NASA. (<a href="https://iscaaslab.com/artificial-intelligence-assisted-spacecraft-trajectory-optimization-and-planning/">link</a>)</p>

</td>

</tr>

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<p style="text-align:right;font-size:small;">

Last Updated: June 2024<br>

Credits for the template to <a href="https://jonbarron.info/">Jon Barron</a>.

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"interactivity": {

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"onclick": {

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"resize": true

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"speed": 3

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