

# Utkarsh Gangwal

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## EDUCATION

| Degree    | Institute                   | CPI/%                   | Year           |
|-----------|-----------------------------|-------------------------|----------------|
| Ph.D.     | University of Delaware      | 4/4                     | 2021 - Present |
| B.Tech    | IIT Gandhinagar             | 8.57/10 (Dept. Rank 1)  | 2017 - 2021    |
| Class XII | Deogiri College, Aurangabad | 92.15 (99th Percentile) | 2016-2017      |
| Class X   | SSHS, Aurangabad            | 10/10                   | 2014-2015      |

## SELECTIVE RESEARCH EXPERIENCE

- **Critical Facility Accessibility and Road Criticality Assessment Considering Flood-induced Partial Failure** [Jun 2022 - Sep 2022]  
*Advisor - Prof. Shangjia Dong (University of Delaware)*
  - Identified accessibility disparities for Delaware state while taking into account partial failure by integrating the depth-disruption function to travel time calculations
  - Used modified betweenness centrality to identify critical roads for access to critical facilities for the network and census block groups
  - Proposed a weighted criticality metric to identify flooded roads critical to disconnected communities for restoring access to critical facilities
- **Critical Facility Accessibility Rapid Failure Early-Warning Detection and Redundancy Mapping in Urban Flooding** [Feb 2021 - Aug 2021]  
*Advisor - Prof. Shangjia Dong (University of Delaware)*
  - Developed a network-theory-based detection model to identify the critical point after which the rate of road access loss to critical facilities starts to accelerate
  - Calculated the number of critical facilities that each network component has access to within reach and reveal the resource redundancy inequity and risk disparity across the network
  - Spatially mapped the accessibility and identified service deserts for Harris County, Texas under Hurricane Harvey and 500-year flood
- **Identifying Early-Warning Indicators of Tipping Points in Networked Systems Against Sequential Attacks** [May 2019 - Jun 2020]  
*Advisor - Prof. Udit Bhatia, Prof. Mayank Singh, Prof. Pradumn Kumar Pandey, Dr. Samrat Chatterjee (IIT Gandhinagar)*
  - Predicted and tipping points or critical thresholds of networks, at which further perturbation can lead to instantaneous loss of intended functionality
  - Identified the precursors to the tipping points and determined the entire robustness characteristics of networks with different architecture in presence of disturbances of varying sizes
  - Understood the responses to simultaneous disruptions for the real-world networks (US Airspace Airport network, Indian Railways Network) and synthetic networks (Erdos-Renyi and Barabasi Albert Network)

## PUBLICATIONS

- Gangwal, U., Siders, A. R., Horney, J., Michael, H. A., & Dong, S. (2022). Critical facility accessibility and road criticality assessment considering flood-induced partial failure. *Sustainable and Resilient Infrastructure*, 1-19. doi: [10.1080/23789689.2022.2149184](https://doi.org/10.1080/23789689.2022.2149184)
- Gangwal, U., & Dong, S. (2022). Critical facility accessibility rapid failure early-warning detection and redundancy mapping in urban flooding. *Reliability Engineering & System Safety*, 108555. doi:[10.1016/j.ress.2022.108555](https://doi.org/10.1016/j.ress.2022.108555)
- Gangwal, U., Bhatia, U., Singh, M., Pandey, P. K., Kamboj, D., & Chatterjee, S. (2021). Identifying early-warning indicators of onset of sudden collapse in networked infrastructure systems against sequential disruptions. *Physica A: Statistical Mechanics and its Applications*, 126796. [j.physa.2021.126796](https://doi.org/10.1016/j.physa.2021.126796).

## SELECTED ACHIEVEMENTS & AWARDS

- Received an **Honorable Mention** at the [UD GIS day](#), 2022 for the map "Hospital Access Disparities after Hurricane Harvey in Harris County, TX, 2017"
- Awarded the **Director's Gold Medal** at IIT Gandhinagar for overall outstanding performance among all B.Tech students

- Awarded the **Institute Gold Medal** at IIT Gandhinagar for securing the highest cumulative performance index among all B.Tech Civil Engineering students
- Chatterjee, Samrat, et al. "A Network-of-Network Approach for Cyber-Based Contingency Analysis of Interdependent Infrastructure Networks Under Uncertainty." Society of Risk Analysis, Washington DC (2019) (Awarded the **best poster award**)
- Awarded the **Scholarship for Academic Excellence** at IIT Gandhinagar for the academic year 2017-18, 2018-19, and 2019-20
- Recipient of **Dean's List Honour**, Semester- I of Academic Year- 2018-19 and Semester- I of Academic Year- 2019-20

## PROGRAMMING SKILLS AND SOFTWARES

- **Programming Languages:** Python 3.0, R (Basics), HTML & CSS (Basics), Matlab (Basics)
- **Tools:** ArcGIS Pro, SAS, Gephi, Autodesk Inventor,  $\text{\LaTeX}$

## SELECTED COURSE PROJECTS

- **Transportation Asset Management Plan (TAMP) for City of Newark** [Feb 2022 - May 2022]  
Course title: *Advanced Infrastructure Management Bootcamp* (Advisor - Prof. Sue McNeil) (University of Delaware)
  - Developed a TAMP along with 4 members for Newark business area and outlined the strategy to prioritize & preserve assets
  - Analyzed the associated risks while proposing various asset management process enhancements
- **Risk assessment of drone delivery on a university campus** [Oct 2021 - Dec 2021]  
Course title: *Risk Analysis* (Advisor - Prof. Shangjia Dong) (University of Delaware)
  - Worked in a team of 3 to identify the risk associated with drone delivery system
  - Calculated the consequence by developing a mathematical model as a combination of complete and partial drone damage, human injuries, and fatalities

## SELECTED POSITIONS OF RESPONSIBILITY

- **Convener, Student Senate** [Jul 2020 - Apr 2021]  
(Chairman, Student Senate, IIT Gandhinagar)
  - Represented the views of student community in the institute senate (chaired by director IITGN) and also a member of the Senate Student Affairs Committee (SSAC)
  - Created IITGN's first *Constitution for Student Governance* and revamped the POR (Position of Responsibilities) verification process to make it efficient and reliable
  - Convened the student senate meetings and restructured the senate meetings to increase the efficiency
- **Co-founder and member, SynOCE** [Jan 2019 - Apr 2021]  
(Syndicate of Civil Engineers, IIT Gandhinagar)
  - Organized various sessions to increase interaction among undergraduate and graduate Civil engineering students
  - Created the first edition of Sync with CE: magazine of SynOCE along with a few other members
- **Sponsorship Team Executive & Networking Dinner Coordinator, Amalthea '18** [Jul 2018 - Oct 2018]  
(Annual Technical Summit, IIT Gandhinagar)
  - Assisted in raising a sponsorship amount of rupees 35.2 lacs
  - Managed the logistics of Networking Dinner which was attended by more than 100 prominent guests

## MENTORSHIP EXPERIENCES

- **REU Mentor** [Jun 2022 - Aug 2022]  
(University of Delaware)
  - Mentored an undergraduate student with different steps of research including problem formulation, methodology, and visualization
  - Conducted frequent meetings to guide the student through various tasks of the REU program
- **Student Guide** [Nov 2020 - April 2021]  
(IIT Gandhinagar)
  - Guided and assisted B.Tech first-year students with their academics, extra-curricular activities and helped them in getting familiar with the culture of IIT Gandhinagar
  - Conducted multiple sessions along with fellow student guides to increase interaction among students