Expression of Interest

Contact Details

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Short Description of the Organisation

Özyeğin University (OzU), founded in 2007, in Istanbul, Turkey as a non-profit foundation university, positions itself to be one of the most innovative and research-oriented universities in Turkey. OzU has ranked in the top 10 in the Entrepreneurial and Innovative University Index, prepared in the leadership of the Scientific and Technological Research Council of Turkey (TUBITAK) since 2012. In the Times Higher Education (THE) Emerging Economies University Rankings 2021, OzU is ranked in the top 250 universities and named one of the top five foundation universities in Turkey.

There are six Faculties (Faculty of Engineering, Faculty of Social Sciences, Faculty of Law, Faculty of Business, Faculty of Aviation and Aeronautical Science and Faculty of Architecture and Design), three Graduate Schools (Graduate School of Engineering, Graduate School of Business and Graduate School of Social Sciences), two Schools (School of Applied Sciences and School of Languages) and eight Research Centers hosting 7552 undergraduate, 717 graduate and 210 doctorate students and 485 academic and 345 administrative staff in OzU. In 2012, to contribute to the leading research university role of OzU, Technology Transfer Office was established to support researchers about national and international grants applications, promote, and contribute university-industry collaborations, and to manage all Intellectual and Industrial Property Rights (IPR). Additionally, OzU has launched the first business acceleration program, Start-up Factory, in order to create, guide, and develop high potential and sustainable entrepreneurs.

As of May 2022, OzU's research portfolio has reached to 170 Million TL with 723 projects. This budget mainly comes from the EU and TÜBİTAK (The Scientific and Technological Research Council of Turkey) funds, and the rest from industrial partnerships and other funding institutions. Since 2013, OzU has 317 pending national and international patent applications; 168 of which have been filled with industry and other universities. OzU's IP portfolio currently contains 101 registered patent and 3 registered beneficial models. OzU has also strong relationships with industry including national and international companies from all over the world. As of May 2022, 384 projects are carried out with 30 Million TL budget and 7 projects are at the contract stage.

Researchers' Profiles

Bekir O. Bartin

Dr. Bekir O. Bartin (https://www.ozyegin.edu.tr/en/faculty/bekirbartin) is a full time Associate Professor in Civil Engineering Department at Ozyeğin University in Istanbul, Turkey. Prior to his current position he was the founding chair at Civil Engineering Department at Altınbaş University (formerly Istanbul Kemerburgaz University). Dr. Bartin is also the academic lead of the collaboration between Ozyegin University and Sustainable Mobility Initiative, an independent association led by Renault Group, founded to contribute integration of mobility systems to the new order and to create opportunities to develop new innovative solutions.

Dr. Bartin received his doctorate degree in 2006 in in Civil and Environmental Engineering from Rutgers University. After receiving his PhD degree, he worked as a full-time research associate at Rutgers University from 2006 to 2012, where he conducted research projects, supervised a team of graduate students, and taught graduate and undergraduate courses.

Dr. Bartin is one of the leading scientists in the area of simulation models of large scale complex transportation systems, application of reinforcement learning methods in traffic simulation, economic evaluation of transportation

investment projects, traffic safety and security. He has served as the principal and co-principal investigator of more than 20 research projects. Dr. Bartin has published 35 peer-reviewed journal articles, 2 book chapters and nearly 50 conference proceedings. He is an affiliate of the C2SMART center, a first tier University Transportation Center at New York University (NYU), funded by the U.S Department of Transportation.

Sedat Ozer

Dr. Sedat Ozer (https://www.ozyegin.edu.tr/en/faculty/sedatozer) is a full time assistant professor at the Department of Computer Science of Ozyegin University. Dr. Ozer has established and runs the MultiRobot Intelligence and Perception Lab at Ozyegin University. Dr. Ozer is He is a recipient of TUBITAK's prestigious 2232: "International Fellowship for Outstanding Researchers" award.

Dr. Sedat Ozer received his Ph.D. degree in 2013 from Rutgers University, New Jersey, where he worked on analysis and visualization of time-varying volumetric and scientific data sets and his focus was on the development of object segmentation, tracking and activity detection algorithms. As a research associate, he worked at multiple research institutions including Virginia Image and Video Analysis (VIVA) Lab at the University of Virginia, Computer Science and Artificial Intelligence Lab (CSAIL) at the Massachusetts Institute of Technology (MIT) and Center for Research in Computer Vision (CRCV) at the University of Central Florida. His research interests cover developing new, scalable and explainable machine learning algorithms, developing new path planning algorithms and techniques for data reduction, video analysis, data fusion & data analysis applications for intelligent and self-driving autonomous systems. He served as a publicity co-chair for IEEE Connected and Automated Vehicles Symposium in 2019. He also serves as a reviewer in multiple IEEE transactions and conferences related to computer vision, pattern recognition, neural networks, robotics and image processing including IEEE TIP, TPAMI, Journal of PR, NeurIPS, ICML, ICLR and RSS.

Dr. Ozer's expertise mainly lies in the junction of data analysis and novel algorithm development. Dr. Ozer has the authors of 7 peer reviewed journal articles, numerous book chapters and conference proceedings, all published in top journals in their respective fields. He has worked on many academic projects related to Dept. of Energy and defence programs in the US. Currently he is working on developing novel artificial intelligence based algorithms to make drones and unmanned autonomous systems smarter. In particular, he is focusing on computer vision based object detection, segmentatation and object tracking algorithms by developing novel deep learning based approaches. He has organized the first special session on "autonomous vehicles using deep learning based techniques" in Turkey in 2022.

Burcu Balcik

Prof. Dr. Burcu Balcik (https://faculty.ozyegin.edu.tr/burcub/) has been a faculty member at the Industrial Engineering Department of Ozyegin University since 2011. She has established and runs the Humanitarian Operations and Disaster Management Lab (HODM) (https://labs.ozyegin.edu.tr/humops/).

Burcu Balcik received her Ph.D. in Industrial Engineering from the University of Washington in 2004, since when she has been working on research topics related to humanitarian supply chains and logistics. After her PhD, she worked as a postdoctoral researcher in the Industrial Engineering and Management Sciences Department at Northwestern University (2008-2009), a visiting researcher at HUMLOG Institute at Hanken School of Economics (2010), and a visiting professor at HEC Montreal (2017-2018).

Prof. Balcik is one of the pioneering scholars in the field of humanitarian operations and disaster management, where she uses analytical modeling techniques (mathematical modeling, optimization, algorithms) to support decision making by developing tools and/or developing managerial insights. In her projects, she has collaborated with a wide group of practitioners from governmental and non-governmental organizations. She published more than 20 academic papers to date in prestigious journals, most of which are highly cited. She has more than 5000 citations to date.

With her research, she has received several research awards including the Turkish Science Academy's Young Scientist Award (BAGEP, 2014), Production and Operations Management Society (College of Humanitarian Operations and Crisis Management) Best Paper Award (2019), Faculty Research Excellence Award (Özyeğin University, 2020). She is one the keynote speakers in the upcoming EURO 2022 Conference in Finland.

Prof. Balcik is an associate editor of the Transportation Science and is a member of the Editorial Boards of several field journals such as the Productions and Operations Management, Transportation Research Part E: Logistics and Transportation Review, Journal of Humanitarian Logistics and Supply Chain Management, and Sustainability Analytics and Modeling.

Prof. Balcik has access to a large network of researchers in Europe and North America that focus on research in humanitarian logistics. She has been an active member of professional societies. She served as the president of INFORMS Public Sector Operations Research (2015-2017) and is currently a co-coordinator of the EURO Working Group on Humanitarian Operations (EURO-HOpe).

Balcik has extensive contextual knowledge on disaster preparedness and emergency response, and access to organizational contacts and real data related to disaster preparedness and response both nationally and globally. Being in Istanbul, which is a highly populated metropolitan city prone to earthquakes and involves different population groups and communities such as millions of refugees, she has access to public and non-profit organizations and data from a unique context. She also has case study data sets (involving disaster scenarios complied from historical data) for other disaster preparedness and emergency response contexts in different regions of the works.

Prof. Balcik has close connections with international agencies, such as the International Federation of Red Cross and Red Crescent, the Caribbean Disaster Management Agency, and the ESUPS Working group (involving agencies such as the Save the Children, Welt Hunger Hilfe, United Nations Humanitarian Response Depot. She has been also collaborating with public authorities in Turkey and Europe for several projects that address crises management during pandemics and disasters.

Ebru Tekin Bilbil

Dr. Ebru Tekin Bilbil (https://www.ozyegin.edu.tr/en/faculty/ebrutekin) is an expert on urban governance. She has extensive experience with stakeholders in local government and transport network governance. She is the academic coordinator of Project on "the Turkey & Europe | An Integrated Service-Device-Technology Roadmapping for Smart and Green Cities Alliances" aiming to create an integrated service-device-technology roadmap to support and generate new ideas for data management in cities. In this joint project of TÜSİAD - TÜRKONFED, Institut du Bosphore, Berlin Bosphorus Initiative, Ozyegin University, she worked with managers and professionals involving city's risk assessment projects in municipalities and ministries in Turkey and Germany. The project participants in project activities included the Istanbul Metropolitan Municipality, Izmir Metropolitan Municipality, Gaziantep Metropolitan Municipality, Konya Municipality, Ankara Metropolitan Municipality, Berlin Municipality, EBRD, ARUP, Bursa Metropolitan Municipality, Ministry of Environment, Urbanization and Climate Change, AFAD, AKUT, universities (i.e., Istanbul Technical University, Gothenborg University, Nord University, Bogazici University), UN-Habitat representative, consular representatives (France and Germany), Ernst and Young, EU Delegation to Turkey, Interreg IPA CBC Bulgaria – Turkey, Confindustria Italy, Catapult UK, Needs Map Turkey, SAP Turkey.

Specific Skills Related to the Project

Developing and testing new generation multimodal, flexible, agile and adaptable, secure and resilient transport network and traffic management systems, leveraging state of the art technologies (e.g. artificial intelligence, big data, edge computing, internet of things, blockchain).

Dr. Bartin has extensive knowledge and experiene in developing and testing traffic management systems. In a recently completed research project with New York State Department of Transportation in collaboration with New York University, he and the research team developed an online traffic management software called DWICE, designed to help the traffic operation center to coordinate and consolidate short term and long term construction and maintenance projects to reduce their traffic impacts. The tool makes use of historical speed and travel time data, up-to-date database of all construction and maintenance projects in the state, and historical crash data to determine if and how projects within the same vicinity can be consolidated and coordinated. Similar tools were developed by Dr. Bartin and his research team, called ASSIST-ME and RILCA. ASSIST-ME was designed to analyze and visualize transportation planning model outputs and RILCA was designed as a stand-alone desktop tool, a precursor to DWICE. The related projects and relevant papers publised are listed as follows :

- "Coordinated ITS Deployment in New York City (CIDNY) – Task 2" funded by New York Department of Transportation (2014-2017)
- "Highway Repair Consolidation Feasibility (2016-02)" funded by New Jersey Department of Transportation for the Period of 04/12-04/14.
- "ASSIST-ME Post-processing Tool for Transportation Planning Model Output." *Transportation Research Record: Journal of the Transportation Research Board*. Vol. 2399. pp. 63-73.
- "Interactive Lane Closure and Traffic Information Tool Based on a Geographic Information System." *Transportation Research Record: Journal of the Transportation Research Board*. Vol. 2272. pp. 44–55.

Dr. Ozer has expertise <u>in developing novel algorithms for big data analysis, artificial intelligence and computer vision.</u> His expertise covers both pure theory development and applications. His experience also covers data analysis and developing algorithms for multimodal datasets where the data comes in different modalities. In his ongoing research project, funded by TUBITAK 2232 program, named 'Development of Deep learning based object detection algorithms for UAVs', he develops computer vision based algorithms running on multimodal datasets for better object detection, object tracking purposes.

Dr. Ozer has experience in developing novel machine learning and deep learning algorithms; analyzing datasets and developing algorithms for social network datasets & computational fluid dynamics simulations, segmenting objects in natural (ground taken) images and in aerial images related to several USA based goverment funded projects. He has developed different machine learning based algorithms to utilize and fuse multi-model datasets acquired by different imaging tools to detect (prostate) cancer with better precision. His recent research focus is developing novel deep learning based algorithms for autonomous drones covering computer vision, path planning and control topics. A list of his selected papers pertaining to this topic is shown below:

<u>Selected publications relevant to Multispectral-Data fusion</u>**:**

- S. Ozer, M. Ege, M.A. Ozkanoglu "SiameseFuse: An Efficient and Not-So-Deep Network to Fuse Visible and Infrared Images", Journal of Pattern Recognition*, Vol.129: 108712, 2022.*
- M. A. Ozkanoglu, S. Ozer, "INFRAGAN: A GAN Architecture to Transfer Visible Images to the Infrared Domain", Journal of Pattern Recognition Letters, 2022.
- S. Ozer, D. L. Langer, X. Liu, M. A. Haider, T. H. van der Kwast, A. J. Evans, Y. Yang, M. N. Wernick, I. S. Yetik, "Supervised and Unsupervised Methods for Prostate Cancer Segmentation With Multispectral MRI ", Journal of Medical Physics, Vol. 37, Issue:4, April 2010.
- S. Ozer, M.A. Haider, D.L. Langer, T.H. van der Kwast, A.J. Evans, M.N. Wernick, J. Trachtenberg, I.S. Yetik, "Prostate Cancer Localization with Multispectral MRI Based on Relevance Vector Machine", IEEE International Symposium on Biomedical Imaging, ISBI09, Boston, MA, June28-July01, 2009.

<u>Selected publications relevant to novel algorithm, system and approach development</u>**:**

- H.E. Ilhan, S. Ozer, G.B. Kurt, H.A. Cirpan, "Offloading Deep Learning Empowered Image Segmentation from UAV to Edge Server", 44th IEEE International Conference on Telecommunications and Signal Processing (TSP), July, 2021.
- S. Ozer, "Similarity Domains Machine for Scale-invariant and Sparse Shape Modeling", *IEEE Transactions on Image Processing,* Vol.28, no.2, pp.534-545, 2019.
- S. Ozer, D. Silver, K. Bemis, P. Martin, "Activity Detection in Scientific Visualization", IEEE Transactions on Visualization and Computer Graphics, Vol.20, no.3, pp.377-390, March 2014.
- S. Ozer, C.H. Chen, H.A. Cirpan, "A set of new Chebyshev kernel functions for support vector machine pattern classification", Pattern Recognition, Vol. 44, Issue 7, pp.1435-1447, July 2011.
- D. Feldman, S. Ozer, D. Rus, "Coresets for Vector Summarization with Applications to Social Graphs", ICML 2017, Sydney, Australia. (Received the NVIDIA Pioneering Research Award).
- S. Ozer, J. Wei, D. Silver, K.-L. Ma, P. Martin, "Group Dynamics in Scientific Visualization", Large Data Analysis and Visualization LDAV, IEEE Symposium on, 2012.

<u>Selected publications relevant to Computer Vision:</u>

- O. Sahin, S. Ozer, "*YOLODrone+: Improved YOLO Architecture for Object Detection in UAV Images*", IEEE Conference on Signal Processing and Communications Applications, (SIU2022), May, 2022.
- H.E. Ilhan, S. Ozer, G.B. Kurt, H.A. Cirpan, "Offloading Deep Learning Empowered Image Segmentation from UAV to Edge Server", 44th IEEE International Conference on Telecommunications and Signal Processing (TSP), July, 2021.

- O. Sahin, S. Ozer, "*YOLODrone: Improved YOLO Architecture for Object Detection in Drone Images*", 44th IEEE International Conference on Telecommunications and Signal Processing (TSP), July, 2021.
- M. Taspinar, Y. Gurses, M. Yurt, S. Ozer, "GRJointNET: Joint Completion and Part Segmentation on 3D Incomplete Point Clouds", IEEE Conference on Signal Processing and Communications Applications (SIU2021), June, 2021.
- D. Gozen, S. Ozer, "Visual Object Tracking in Drone Images with Deep Reinforcement Learning", IEEE, 25th International Conference on Pattern Recognition (ICPR2020), ITALY 10 - 15 January 2021.
- B. M. Albaba, S. Ozer, "SyNet: An Ensemble Network for Object Detection in UAV Images", IEEE, 25th International Conference on Pattern Recognition (ICPR2020), ITALY 10 - 15 January 2021.
- R. Valiente, M. Zaman, S. Ozer, Y. Fallah, "Controlling Steering Angle for Cooperative Self-Driving Vehicles utilizing CNN and LSTM based Deep Networks", IEEE, Intelligent Vehicles Symposium (IV2019), 2019.

Prof. Balcik can contribute to the project with her extensive background and experience in logistics research, especially in formulating and solving disaster preparedness and emergency response problems under uncertainty. Her previous work in disaster preparedness and emergency response covers various problems related to distribution network design, emergency supply prepositioning, last mile distribution, rapid needs assessment, coordinated resource planning, etc. She has mostly focused on challenges related to quick onset disasters (e.g., earthquakes, hurricanes), but she also has work on slow-onset disasters (e.g., conflicts).

In her recent projects, Balcik and her colleagues have been developing methods that combine financial and operational planning for disaster preparedness by using methods from catastrophic insurance theory, which focuses on managing risks associated with low-probability high impact events. The following papers focus on developing a framework among different countries that are prone to similar disaster risks, and present case studies by focusing on hurricane preparedness in the Caribbean by considering the differences among countries in terms of disaster risk and economic welfare.

- Balcik, B., Silvestri, S., Rancourt, M.E, Laporte, G. 2019. "Collaborative Prepositioning Network Design for Regional Disaster Response", *Production and Operations Management,* 28(10), 2431-2455.
- Rodríguez-Pereira, J., Balcik, B., Rancourt, M.E, Laporte, G. 2020. "A Cost Sharing Mechanism for Multi-Country Partnerships in Disaster Preparedness", *Production and Operations Management, 30(12), 4541-4565.*
- Zbib, H., Balcik, B., Rancourt, M.E., Laporte, G., 2021. "Mutual Catastrophe Insurance Framework for Horizontal Collaboration in Prepositioning Strategic Reserves", Operations Research, under revision.

The proposed framework in these studies is general and can be adapted to transportation network disruptions and their impact on traffic.

Assessing and simulating the effects on multimodal network and traffic management of new forms of mobility
&
Performing simulations for network-wide optimisation of traffic models

Dr. Bartin has extensive knowledge and experience in microscopic simulation of traffic and transportation facilities. He successfully completed numerous simulation related projects in the past through research projects funded by the New Jersey Department of Transportation and New Jersey Turnpike Authority. These projects are listed below.

- "Newark Bay-Hudson County Extension, Milepost N6.00 to N8.20 Bridge Deck Reconstruction Eastbound and Seismic Retrofit – Traffic Impact Study" funded by New Jersey Turnpike Authority (2015 - 2016)
- "Traffic Simulation Modeling and Analysis of Interchange 14A and Proposed Concept 11D" funded by the New Jersey Turnpike Authority for the period 2012-2013.
- "Regional Traffic impact Study for Newark Bay-Hudson County Extension Milepost N6.00 TO N8.20 Bridge Deck Reconstruction and Miscellaneous Improvements", funded by the New Jersey Turnpike Authority for the period 2009-2011.
- "Jersey City/Newark Urban Area Security Initiative Regional Evacuation Plan" funded by the US Department of Homeland Security for the period of 01/2008 - 01/2010.
- "Microscopic Simulation of Garden State Parkway / New Jersey Turnpike –Phase 1 & 2" funded by New Jersey Turnpike Authority for the period of 09/2005- 04/2010. "Simulation and Analysis of Clark Circle -

- Exit 135 of Garden State Parkway" funded by New Jersey Turnpike Authority for the period of 09/05-01/06.
  - "South Jersey Motorist Information System." funded by New Jersey Department of Transportation for the period 5/1/00- 1/30/02

Prof. Balcik's research group has expertise in mathematical modeling, deterministic and stochastic optimization, and heuristic algorithms, which can be of significant use in this project. She also collaborates with the faculty and researchers from different disciplines at Ozyegin University.

Demonstrating the collection, aggregation, analysis and use of network-wide data from infrastructures, vehicles/vessels and users (using ICT and EU satellite-based systems), from across transport modes (modal and intermodal data), stakeholders and national borders.

Dr. Bartin worked extensively with vehicle location data through past research projects. The most notable one is the research project conducted with New Jersey Turnpike Authority in which the electronic toll collection (ETC) data of individual vehicles traveling on New Jersey Turnpike was provided to the research team for origin-destination and travel time extraction within the tolled facility. The dataset encompassed all ETC data from 2004 to 2016, nearly 180 GB of all vehicle transaction data. He and his research team was assigned to write a parsing code to extract various traffic information, such as volume, travel time and time varying origin-destination matrices.

Dr. Sedat Ozer has expertise and experience in analyzing datasets and developing novel algorithms according to the needs of domain experts to help them analyze their simulations and their acquired datasets. A selected list of his relevant publications are listed below :

- W. Hua, K. Bemis, D. Kang, S. Ozer, D. Silver, "A Hybrid 3D Eddy Detection Based on Surface Height and Velocity Field", IEEE Vis Posters, 2022.
- K. G. Bemis, D. Silver, G. Xu, R. Light, D. Jackson, C. Jones, S. Ozer, L. Lui, "The Path to COVIS: a review of acoustic imaging of hydrothermal flow regimes", Journal of Deep-Sea Research Part II, 2015.
- A.Y. Kaleli, A.F. Unal, S. Ozer, "Simultaneous Prediction of Remaining-Useful-Life and Failure-Likelihood with GRU-based Deep Networks for Predictive Maintenance Analysis", 44th IEEE International Conference on Telecommunications and Signal Processing (TSP), July, 2021.
- S. Ozer, K. Bemis, W. Hua, A. Goktogan, M. Aydogan, K. Guo, D. Kang, L. Liu, D. Silver, "The Use of 3D Optical Flow, Feature-Tracking and Token-Tracking PetriNets to Analyze and Visualize Multiple Scales of Ocean Eddies", IEEE Vis Conference, received: SciVis Contest 2020, Honorable Mention Award, 2020.

Prof. Balcik has extensive experience in modeling and optimization independent infrastructures in the context of coordinated repair routing problem for post-disaster recovery of interdependent infrastructure networks, which can also be extended to the current project. Also, she has been working on drone routing for post-disaster damage assessment.

Performing early pilot activities on multimodal network and traffic management of limited scale in mobility hubs

Dr. Bartin can contribute to the project based his past research experience in conducting pilot studies. For example, in a completed project conducted with New Jersey Transit Authority, titled "MyTix: NJ Transit's Mobile Ticketing Application (2011-05)", Dr. Bartin and his team developed and tested a mobile ticketing application for train commuters to be able to buy tickets on their mobile smartphones, which is being frequently used today, called *MyTix*. The idea was to replace the old style paper tickets with e-tickets, and one of the pioneering applications within the US in 2012. As part of the project, his research team conducted various pilots on different lines before rolling out for the entire transit network. The aim of these pilots were to evaluate the mobile ticketing app via user surveys and usage logs based on both quantitative and qualitative metrics. The research paper produced as part of this project is titled "Evaluation framework for mobile ticketing applications in public transit: a case study." *IET Intelligent Transport Systems*. Vol. 12. Issue 9. pp. 1166-1173."

Dr. Sedat Ozer, based on his extensive signal processing and data analysis experience, can facilitate the data analysis part where he can pinpoint what studies can affect the performance the most.

Developing and showcasing workable governance and dynamic incentive models, for the effective engagement of public and private stakeholders in interoperable data exchange, in the optimisation of transport network and traffic management and in promoting a better use of (public) transport systems.

Dr. Bilbil can contribute to this project with with her expertise on the governance network theories and on new governance networks, stakeholder analysis and new forms of meta-governance strategies for transport networks. She can contribute to this project with her experience on stakeholder engegement and possible conflict/tensions between them in data sharng and in regulating digital technologies and regulating innovation. Currently, she is the academic coordinator of the Project entitled "Turkey and Europe: Integrated Service-Device-Technology Roadmap Project for Smart Cities", with the project partners of TÜRKONFED, Institut du Bosphore, Berlin Bosphorus Initiative, Ozyeğin University (OzU) and OzU - TÜSİAD Sustainable Development Forum. The project aims to create a dialogue platform on data exchange on transport network and to help balance their coordination between diverse stakeholders; and to facilitate the design of short, medium and long-term transport network strategies in selected cities. The project includes the following phases: the need assessment; the stakeholder analysis; the roadmap creation on service/device/technology integration; and the design of dialogue platform.

Evaluating the qualitative and quantitative impact of the proposed measures and project results, including on reducing travel delay, transport emissions and energy consumption, with a clear baseline for each use case.

Through his previous research project experience, Dr. Bartin can contribute to the project team related to evaluating the impact of proposed measures and project results. Few studies that come to mind in this respect include the impact of electronic toll collection vs. Manual toll collection on air pollution levels in New Jersey Turnpike tolled facility ("Impact of Electronic Toll Collection on Air Pollution Levels: Estimation Using Microscopic Simulation Model of Large-Scale Transportation Network." *Transportation Research Record: Journal of the Transportation Research Board*. Vol. 2011. pp. 68-77.) and the impact of removing toll barriers on vehicle safey on the same tolled facilities ("Effect of Open Road Tolling on Safety Performance of Freeway Mainline Toll Plazas." *Transportation Research Record: Journal of the Transportation Research Board*. Vol. 2324. pp. 101-109.)

Proposed Activities for the Project

A heavy reliance on private cars led to inexorable presence of traffic congestion and air pollution. Urban accessibility has gotten worse, and people's ability to live comfortably is under threat. As a result, in the last decade, we have seen different options to private cars such as ridesharing, ride hailing and shared transportation services, and especially micromobility modes. One common downside of these alternative mobility options is that they compete for the same limited road infrastructure and resources; and cars are getting the largest piece of the pie. Eventually, the space currently occupied for private vehicles need to be allocated efficiently for all available modes. Among these new modes, micromobility offers a great deal of potential for the first and last mile problem for people that would like to switch from private cars to public transportation, yet the current infrastructure does not provide feeder lanes exclusive to micromobility to efficiently reach public transportation. This limits the adoption of this upcoming mode as a means for people switching to public transportation.

For the specific call, we, as the research team from Ozyegin University, propose the following topic jointly with an expert team of researchers and practitioners:

- Optimize the location of select number of exclusive feeder lanes in a select transportation network that would maximize the increase in the switch to public transportation.
- Estimate the impact of allocating the current infrastructure to micromobility users in terms of traffic delay and travel time using microscopic simulation analyses.
- Demonstrate pilot in select cities or at a few locations in a select city and comparatively evaluate these street experiments that aim at reducing the dominance of cars by pivoting from "streets for traffic" towards "streets for people.
- Investigate the use of computer vision and artificial intelligence methods to (i) measure the usage of these lanes (in terms of vehicles per time) and (ii) prevent and discourage the illegal use of exclusive

lanes by motorized traffic (e.g. blocking or parking in exlusive lanes) using images obtained from unmanned aerial vehicles (UAVs) that are used to periodically monitor these lanes.

- Estimate the safety implications of the proposed exclusive lanes especially in terms of their interaction with motorized vehicles at intersections under normal conditions and for the case when connected and autonomous vehicles are present.
- Conduct stakeholder mapping and determine implementation strategies to ensure the success and sustainability of the projects based on the premise that stakeholders, including relevant public groups, have the power to support or hinder projects as end users and that having knowledge and a say over project process helps stakeholders embrace its outcomes.

References

Project acronym / starting date	Main objectives	Main activities	Role in the project
Calibration / Development of Safety Performance Functions for New Jersey" by New Jersey Department of Transportation	Estimating safety performance functions for various types of roadway segments and intersections	Data collection, extraction, statistical model development using generalized linear models	Dr. Bartin was the co- Principal Investigator
Newark Bay-Hudson County Extension, Milepost N6.00 to N8.20 Bridge Deck Reconstruction Eastbound and Seismic Retrofit – Traffic Impact Study" funded by New Jersey Turnpike Authority	Understanding the qualitative impact of a long term closure in terms of vehicles delays.	Developing a large scale traffic simulation model and conducting various lane closure analyses and estimating their impacts under various demand and diversion scenarios.	Dr. Bartin was the co- Principal Investigator
"Highway Repair Consolidation Feasibility (2016-02)" funded by New Jersey Department of Transportation	Development of a lane closure estimation tool	Developing a GIS-based desktop tool aimed to estimate and visualize the impact of lane closures, and the benefits of coordination/consolidation of projects in the same vicinity.	Dr. Bartin was the co- Principal Investigator
MyTix: NJ Transit's Mobile Ticketing Application (2011-05)" funded by New Jersey Department of Transportation	Development and testing of a mobile ticketing app	The project involved the development of a mobile ticketing app for NJ Transit and conducting pilot roll-outs of the app and measuring the usability and acceptance of the app via surveys.	Dr. Bartin was the co- Principal Investigator
Traffic Simulation Modeling and Analysis of Interchange 14A and Proposed Concept 11D	Simulation modelling and analyses of a toll plaza at New Jersey Turnpike	Development of a microscopic traffic simulation model of the toll plaza and estimating the traffic impact of various design alternatives	Dr. Bartin was the co- Principal Investigator in this project
CONTRA (COVID-19 Network Technology based Responsive Action)	The purpose of this international project, with researchers from Norway, Belgium and Turkey, is to understand the COVID-19 vaccine allocation system in a country and develop a decision support tool for guiding equitable, effective and sustainable allocation decisions.	The activities of the project involved stakeholder and system mapping, optimization modeling, developing a decision support tool, and validation.	Prof. Balcik has been a co-PI and the leader of a work package, which focuses on developing an optimization model for vaccine allocation that captures the inherent characteristics of the COVID-19 vaccine system. Her research group also supported the design of an open-access decision support platform for public health organizations (https://contra.agens.no/).

Resource Planning Problems and Models for Effective Management of Chronic Dialysis Patients after a Disaster	This project focuses on developing methods to support serving vulnerable people with chronic dialysis conditions after a disaster with the scarce health care resources. It aims to support coordination of disaster preparedness and response.	The project involves developing optimization models for assigning patients to functioning dialysis centers by considering scheduling of patient treatments. The project addresses multiple planning problems addressing both disaster preparedness and emergency response phases. Case studies with real data from Istanbul dialysis network are developed within the scope of the project.	Prof. Balcik is the PI of the project, and she has been leading the project group that involves health care research experts and medical doctors.
Modelling and Analysis of Stock Sharing and Postponement Strategies in Humanitarian Relief Depots	This project, which is collaborative work with academic and humanitarian practitioners, aims to quantify and measure the effects of collaboration in humanitarian depots.	Simulation and optimization techniques are used to model emergency response with and without stock sharing. Data from international humanitarian organizations are used to perform case analysis.	Prof. Balcik is the PI of the project. She closely works with multiple humanitarian agencies in this project.
A collaborative pre-positioning model for strengthening regional disaster response capacity	This international project, which involves researchers from Canada, Spain and Turkey, aims to develop a collaborative prepositioning network for disaster preparedness and response to enhance the capacity of vulnerable regions under disaster threats. The project is conducted by close collaboration with the humanitarian and governmental agencies from the Caribbean.	Stochastic optimization techniques are used to model different problems that involve prepositioning network design and cost allocation decisions. Researchers have devised a novel insurance based disaster financing mechanism.	Prof. Balcik has initiated this stream of work and has been involved in multiple projects on the topic.
Selective Routing Problems for Post-Disaster Needs Assessment: Models and Solution Methods	This funded project aims to develop mathematical models and solution approaches for assisting needs assessment teams, which haveto quickly perform needs assessment operations after a disaster.	Vehicle routing models and heuristic methods have been developed to support needs assessment operations.	Prof. Balcik is the primary investigator of the project.
Development of Deep learning based object detection algorithms for UAVs'	This funded project aims to develop deep learning based computer vision algorithms for UAVs.	Developing object detection algorithms, object tracking, object segmentation using images taken by UAVs.	Dr. Ozer was the principal investigator of the project.