F. Necati Catbas, Ph.D., P.E., F. ASCE, F. SEI
Lockheed Martin St. Laurent Professor of Engineering
Professor of Civil, Environmental and Construction Engineering Department, University of Central Florida
Founding Director of Civil Infrastructure Technologies for Resilience and Safety (CITRS)
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Dr. Catbas is an educator, researcher, mentor and entrepreneur with career objective of advancing the state-of-the-art in structural/infrastructure engineering through innovative, integrated and multidisciplinary research for civil infrastructure systems. This is expected to improve infrastructure performance, operation, safety and security for the benefit of the society. He is currently serving as a full professor with international reputation for his academic activities. He is an educator and a mentor to many successful students. Dr. Catbas achieved excellence in teaching, research and creative activity; and demonstrated service and scope of national and international impact. As a result, he is the recipient of several research, teaching and service awards at UCF and nationally as well as internationally. He is ranked in the top 2% worldwide of his field in civil engineering based on published in article by Stanford researchers (Ioannidis et al, 2020). He received several awards for his research, teaching and service from UCF as well as national and international organizations and societies. In addition, he is also an entrepreneur, and led to successful advanced engineering companies developing technologies for bridges (e.g. health monitoring, crowd-based monitoring, AI, bridge load rating etc), currently operating at the UCF Business Incubator at Central Florida Research Park.

Dr. Catbas is the Founding Director of CITRS (Civil Infrastructure Technologies for Resilience and Safety). CITRS is an initiative to create an enterprise of partnership of academe, government and industry as an inter-disciplinary generator of knowledge and products through the development and application of intelligent monitoring, sensing, material and information technologies for safe and resilient civil infrastructure systems. Through research activities, keynotes and leadership roles, he has strong presence at the national and international level. He has been the Associate Editor of the Premier Journals in Civil/Infrastructure/Structural/Bridge Engineering. He is a highly published author (https://scholar.google.com/citations?user=aBjNcmsAAAAJ&hl=en) He has received awards in several research , teaching and service awards including the inaugural UCF Luminary Award and inducted into UCF Scroll & Quill Society.His research has a very applied nature where he has had real life projects and implementations. Some examples are several dozens of projects and implementations in many states in US such as Florida, Pennsylvania, Ohio, Puerto Rico, and internationally Turkey, Japan, China, Switzerland to name a few. Research products are at http://orcid.org/0000-0001-9255-9976. Some of the recent research topics:

- Developing Smart Infrastructure Systems for Future's Smart Cities by Utilizing Transformative Technologies in Big Data, Deep Learning, Camera and (XR) Mixed Reality Concepts
- Monitoring of Civil Infrastructure Systems (CIS) using Novel Technologies
- Digital Signal & Image Processing and Artificial Intelligence (AI) for CIS with AR/MR app's
- Life-cycle assessment of built infrastructure with public and social considerations and constraints
- Novel Technologies for Sustainable, Smart and Resilient Communities
- Modeling, Model Updating under uncertainty, System Dynamics and Monitoring, Structural System Identification, Damage Detection

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Education:

1998: Post-doctoral Research, Drexel University, Philadelphia, Pennsylvania.
1997: Ph.D. in Civil Engineering, University of Cincinnati, Cincinnati, Ohio.
1993: M.S. in Civil Engineering, Bogazici University, Istanbul, Turkey.
1991: B.S. in Civil Engineering, Bogazici University, Istanbul, Turkey.

Professional Experience:

Lockheed Martin St Laurent Professor of Engineering Civil, Environmental and Construction Engineering (CECE) Department, University of Central Florida 2003 – date
Associate Department Chair, Civil, Environmental and Construction Engineering (CECE) Department, University of Central Florida. 2008 – 2013
Research Assistant Professor, Intelligent Infrastructure Institute, Drexel University and Adjunct Professor at Dept. of Mechanical Engineering & Eng. Mechanics, Drexel University, 1999 – 2003
Research Associate, Intelligent Infrastructure Institute, Drexel University, 1998 – 1999

Other Professional Experience:

Founder and Chief Technology Officer (CTO), Transtek International Group LLC, Orlando, FL
Professional Engineer (P.E.), State of Florida (#700007)
Consultancy to several national and international agencies and companies

Representative Honors and Awards:

2020, Kikuchi-Karlaftis Award by Transportation Research Board, ABJ70 Artificial Intelligence (AI) in Transportation
2020, Inducted into UCF Scroll & Quill Society
2019, Best Paper Award at the Smart City Conference (in all engineering categories)
2018, State University System Research Incentive Award (RIA)
2017, Aftab Mufti Medal, awarded from International Society for Structural Health Monitoring of Intelligent Infrastructure (ISHMII) and Journal of Civil Structural Health Monitoring (CSHM)
2017, UCF Luminary Award, inaugural award presented at a special ceremony on 10/18/2017
2015, Winner of the Technical Excellence Award by All Professional Eng. Societies (e.g. ASCE, ASME, IEEE etc) in Central Florida.
2014, Elected Fellow, Structural Engineering Institute (SEI)
2014, Research Incentive Award (RIA)
2013, Elected Fellow, American Society of Civil Engineers (ASCE)
2013, Invitee by the Royal Academy of Eng. for Global Grand Engineering Challenges, London, United Kingdom (UK)
2012, College of Engineering and Computer Science Excellence in Professional Service Award
2011, National Academy of Engineering Europe-America Frontiers of Engineering, US Delegate
2010, NASA Certificate of Recognition, NASA Glenn Research Center

Professional Memberships and Service *(not a complete list)*:

Past Member of the Executive Board, Society for Experimental Mechanics (SEM)

Chair, Bridge Health Monitoring Committee, International Association for Bridge Maintenance and Safety (IABMAS)

Past Chair, "System Identification of Constructed Facilities" Structural Engineering Institute (SEI) Technical Committee, American Society of Civil Engineers (ASCE)

Past Co-Chair, "Technical Activities Council ", Overseeing the Technical Divisions in Society for Experimental Mechanics (SEM)

Past Chair, "Civil Structures Testing Technical Division", Society for Experimental Mechanics (SEM)

Past Council Member and Secretary, Technical Council on Life-Cycle Performance, Safety, Reliability and Risk of Structural Systems, Structural Engineering Institute (SEI) Technical Committee, American Society of Civil Engineers (ASCE)

Past Chair, "Safety of Bridges" Structural Engineering Institute (SEI) Technical Committee, American Society of Civil Engineers (ASCE)

Member, "Methods of Monitoring and Evaluating Structural Performance Committee" Structural Engineering Institute (SEI) Technical Committee, American Society of Civil Engineers (ASCE)

Member, "Structural Health Monitoring and Control Engineering" Engineering Mechanics Institute (EMI) Technical Committee, American Society of Civil Engineers (ASCE)

Past Member, AFF 40 Field testing and NDE of Transportation Structures, Transportation Research Board (TRB)

Representative Current Editorial Board Membership:

Associate Editor, Journal of Structural Engineering, American Society of Civil Engineers (ASCE)

Associate Editor, Structure and Infrastructure Engineering, Taylor and Francis

Associate Editor, Structural Monitoring and Maintenance, Techno-Press

Associate Editor, Frontiers Built Environment, Structural Sensing

Topic Editor, Frontiers Built Environment, Diagnostic and Proof Load Tests on Bridges

Associate Editor, Advances in Bridge Engineering, Springer Nature Group

Patent/Innovations:

Catbas, F.N. (2013) "Development of iSee (image based Structural Engineering Evaluation)," (filed 08/19/2013, application #61/867,352 (UCF#-32830)

Karaaslan, E., Bagci, U. and Catbas, F.N. (2019) "Methods of artificial intelligence-assisted infrastructure assessment using mixed reality systems" (US Patent App. 17/247,389, 2021 Publication of US11551344B2) (Link to video and Link to patent)

Catbas, F.N. and Dong, C. (2020) "Computer Vision-based System and Method for Assessment of Load Distribution, Load Rating and Vibration Serviceability of Structures" (Provisional patent U.S. serial number 63/195,590, U.S. ser. no. 17/712,038) (Link)

Catbas, F.N. and Dong, C.Z (2021) "Structural Serviceability Monitoring with Infinite Spatial Resolution" (Provisional patent being prepared)

Luleci, F. and Catbas, F.N. (2022) "Condition Assessment of Civil Structures using Immersive Visualization" (UCF and attorneys preparing packet)

Luleci, F., Catbas, F.N. and Avci, O. (2022) "Generative Adversarial Networks for Structural Damage Diagnostics (submitted)

Research Experience

Completed and on-going several funded research projects sponsored with support from federal, state, local agencies and private companies within USA and also from abroad. In 2008, Dr Catbas was induced into Class of the University of Central Florida Research Millionaire's Club. Some of the recent sponsoring and partner agencies are: National Science Foundation (NSF); Federal

Department of Transportation (DOT); Transportation Research Board (TRB) IDEA Program, Florida Department of Transportation (FDOT); Federal Highway Administration (FHWA); NASA FSGC; NASA KSC; NASA MSFC; Space Research Initiative; West-Nippon Expressway Authority, Japan; Transportation Technology Center Inc. (TTCI); Qatar National Science Foundation, Qatar; Scientific and Technological Council of Turkey etc.

Representative Publications

Catbas, F.N., (Eds.) (2014) "Dynamics of Civil Structures", Society for Experimental Mechanics Series, Vol. 4, Springer, ISBN 978-3-319-04545-0 (528 pages)

Catbas, F.N., Kijewski-Correa, Aktan, A.E. (Eds.) (2013) "Structural Identification of Constructed Systems: Approaches, Methods and Technologies for Effective Proactive of Structural Identification", American Society of Civil Engineers (ASCE) SEI, 2013 (234 pages)

Aktan, A. E., Catbas, F. N., Grimmelsman, K. A., & Pervizpour, M. (2003). "Development of a Model Health Monitoring Guide for Major Bridges." Federal Highway Administration Research and Development. (290 pages)

Debees M, Luleci F, Catbas FN (2023) "Effect of Structural Repairs on the Load Rating and Reliability of a Prestressed Concrete Bridge." Advances in Bridge Engineering, Springer 4. https://doi.org/10.1186/s43251-023-00087-0

Luleci F, Catbas FN, Avci O (2023) "CycleGAN for Undamaged-to-Damaged Domain Translation for Structural Health Monitoring and Damage Detection". Mechanical Systems and Signal Processing, 197:. https://doi.org/10.1016/j.ymssp.2023.110370

Luleci F, Avci O, Catbas FN (2023) "Improved Undamaged-to-Damaged Acceleration Response Translation for Structural Health Monitoring." Engineering Applications of Artificial Intelligence, 122:. https://doi.org/10.1016/j.engappai.2023.106146

Luleci F, Catbas FN, Avci O (2023) "Generative Adversarial Networks for Labeled Acceleration Data Augmentation for Structural Damage Detection. Journal of Civil Structural Health Monitoring (13), pages 181–198 (2023). https://doi.org/10.1007/s13349-022-00627-8

Zakaria, M., Karaaslan, E. and Catbas, F.N. (2022) "Advanced Bridge Visual Inspection Using Real-time Machine Learning in Edge Devices" Advances in Bridge Engineering Journal, Springer, 3(1), pp.1-18 https://doi.org/10.1186/s43251-022-00073-y

Catbas, F.N., Luleci, F.; Mahta Zakaria; Bagci,B, LaViola Jr., J., Cruz-Neira, C. and Reiners, D. (2022) "Extended Reality (XR) for Condition Assessment of Civil Engi-neering Structures: A Literature Review" Sensors Journal 2022, 22(23), 9560; https://doi.org/10.3390/s22239560

Aras, F., Akbas, T., Ceribasi, S. and Catbas, F.N. (2022) "Full Scaled Experimental and Numerical Investigation on The Contribution of Masonry Infill Walls Into Dynamic Behavior of RC Buildings" Journal of Structural Control and Health Monitoring, 29 (12), e3141 https://doi.org/10.1002/stc.3141

Luleci, F., Catbas, F.N. and Avci, O. (2022) "A Literature Review: Generative Adversarial Networks for Civil Structural Health Monitoring" Frontiers in Built Environment, Structural Sensing for Asset Management, 11 February 2022 | https://doi.org/10.3389/fbuil.2022.1027379

Catbas, F.N. and Avci, O. (2022) "A Review of Latest Trends in Bridge Health Monitoring" The themed issue 'Bridge and transport network resilience" Bridge Engineering Journal, Institute of Civil Engineers (ICE) (https://doi.org/10.1680/jbren.21.00093)

Mitoulis SA, Domaneschi M, Casas JR, Cimellaro, GP, Catbas FN, Stojadinovic, B, Frangopol, DM (2022) "Editorial: The crux of bridge and transport network resilience – advancements and future-proof solutions". Proceedings of the Institution of Civil Engineers – Bridge Engineering Journal 175(3): 133–137, https://doi.org/10.1680/jbren.2022.175.3.133

Avci, O. and Catbas, F.N. (2022) "Human-Induced Excitations and Vibrations Serviceability of Civil Engineering Structures" Human-Induced Excitations and Vibrations Serviceability of Civil Engineering Structures, Frontiers in Built Environment, https://doi.org/10.3389/fbuil.2022.846351

Dong, C., Li, L., Yan, J., Zhang, Z. Pan, H. and Catbas, F.N. (2022) "Pixel-level fatigue crack segmentation in large-scale images of steel structures using an encoder–decoder network" Sensors 2021, 21(12), 4135; https://doi.org/10.3390/s21124135

Luleci, F., Catbas, F.N. and Avci, O. (2021) "Generative Adversarial Networks for Data Generation in Structural Health Monitoring" Frontiers in Built Environment, Structural Sensing for Asset Management, 11 February 2022 | https://doi.org/10.3389/fbuil.2022.816644

Karaaslan, E., Bagci, U. and Catbas, F.N. (2021) "A Novel Decision Support System for Long Term Management of Bridge Networks" Applied Sciences Journal, Special Issue: Artificial-Intelligence-Based Methods for Structural Health Monitoring" (Volume 125,May 2021, 103634 https://doi.org/10.1016/j.autcon.2021.103634

Modesto, A.J., Birgul, R., Werlink, R. and Catbas, F.N. (2021) Structural health monitoring and damage detection of Composite Overwrapped Pressure Vessels (COPVs) using Auto-Regressive models with eXogenous input (ARX)" Journal: International Journal of Pressure Vessels and Piping (Volume 192, August 2021, 104410) https://doi.org/10.1016/j.ijpvp.2021.104410

Aras, F., Akbaş, T., Çeribaşı, S., Çatbaş, F.N. (2021) "Modelling of Infill Walls in RC Buildings Under Low Amplitude Vibrations" Structures and Buildings Journal, Institute of Civil Engineers (ICE) https://doi.org/10.1680/jstbu.20.00310

Lydon, D., Lydon, M., Kromanis, R., Dong,C.Z., Catbas, F.N., Taylor, S. (2021) "Bridge damage detection approach using a roving camera technique" Sensors Journal 2021, 21, 1246. https://doi.org/10.3390/s21041246

Karaaslan, E., Bagci, U. and Catbas, F.N. (2021) "Attention-Guided Analysis of Infrastructure Damage with Semi-Supervised Deep Learning" Automation in Construction Journal, Elsevier https://doi.org/10.1016/j.autcon.2021.103634 (Volume 125, May 2021, 103634)

Khuc, T., Anh Nguyen, T., Dao, H. and Catbas, F.N., (2020) "Swaying Displacement Measurement for Structural Monitoring Using Computer Vision and an Unmanned Aerial Vehicle" Measurements Journal, Elsevier, Volume 159, 15 July 2020, 107769, https://doi.org/10.1016/j.measurement.2020.107769

Dong, C., Bas, S. and Catbas, F.N. (2020) "A portable monitoring approach using cameras and computer vision for bridge load rating in smart cities" Civil Structural Engineering Journal, Elsevier. 10 (5) (2020): pages 1001-1021 https://doi.org/10.1007/s13349-020-00431-2.

Bas, S., Dong, C.Z, Apaydin, N., Ilki, A. and Catbas, F. N. (2020), "Hanger Replacement Influence on Seismic Response of Suspension Bridges: Implementation To The Bosphorus Bridge Subjected to Multi-Support Excitation", Journal of Earthquake Engineering and Structural Dynamics, 49(14), 1496-1518. (https://doi.org/10.1002/eqe.3314)

Domaneschi, M., Casciati, S., Catbas, F.N., Cimellaro, G.P., Inaudi. D., Marano, G. (2020) "Structural health monitoring of in-service tunnels" International Journal of Sustainable Materials and Structural Systems, Special Issue on: Smart Structures, Structural Control and Health Monitoring (2020 Vol.4 No.2/3/4, pp.268 - 291) 10.1504/IJSMSS.2020.109085

Erdogan, Y. S., and Catbas, F. N. (2020). Seismic response of a highway bridge in case of vehicle-bridge dynamic interaction." Earthquakes and Structures, 18(1), 1–14. https://doi.org/10.12989/EAS.2020.18.1.001

Dong, C-Z., Bas, S. and Catbas, F.N. (2019), (2019) "A completely non-contact recognition system for bridge unit influence line using portable cameras and computer vision" J of Smart Structural Systems, 24(5), 617-630.

Dong, C-Z. and Catbas, F.N. (2019), "A non-target structural displacement measurement method using advanced feature matching strategy" Advances in Structural Engineering Journal, SAGE Publications (Advances in Structural Engineering 1–12, DOI: 10.1177/1369433219856171

Hiasa, S., Catbas, F.N., Matsumoto, M., Mitani, K. (2016) "Monitoring Concrete Bridge Decks using Infrared Thermography with High Speed Vehicles" Structural Monitoring and Maintenance (SMM) Journal, Techno-Press Vol. 3, No. 3 (2016) 277-296;

Catbas, F.N., Gokce, H.B. and Gul, M. (2012) "A Practical Methodology for Load Rating of Existing Highway Bridges: Demonstration on Reinforced Concrete T-Beam Bridges," Journal of Bridge Engineering, 17(4), 652–661, ASCE doi:http://dx.doi.org/10.1061/(ASCE)BE.1943-5592.0000284

Catbas, F.N., Gokce, H.B. and Frangopol, D.M. (2013) "Predictive Analysis by Incorporating Uncertainty through a Family of Models Calibrated with Structural Health Monitoring Data," Journal of Engineering Mechanics, ASCE, Vol. 139, No. 6, pp. 712-724.

Gul, M. and Catbas, F. N. (2011) "Structural Health Monitoring and Damage Assessment using a Novel Time Series Analysis Methodology with Sensor Clustering", Journal of Sound and Vibration, Elsevier, 330 (6), p.1196, Mar 2011

Catbas, F.N., Gul, M., Gokce, H.B., Zaurin, R. Frangopol, D. and Grimmelsman, K.A. (2014) "Critical Issues, Condition Assessment And Monitoring of Heavy Movable Structures: Emphasis On Movable Bridges," Structure and Infrastructure Engineering Journal, Vol 10, Issue 2, pages 261-276

Catbas, F.N., Susoy, M., Frangopol, D. (2008), "Structural Health Monitoring and Analytical Modeling for Reliability Estimation of Long Span Bridges," Journal of Engineering Structures, Elsevier, 30, 2347-2359, 2008.

Catbas, F. N., Shah, M., Burkett, J., & Basharat, A. (2004). "Challenges in structural health monitoring." In Proceedings of the 4th International Workshop on Structural Control (pp. 10-11)

Catbas, F. N., Gul, M., Zaurin, R., Terrel, T., Dere, Y., Ansley, M., .& Grimmelsman, K. (2009). "Structural Health Monitoring for the Safety of Bridges: Fundamental, Application and Organizational Considerations." In ASCE Structures Congress (Vol. 9).

Research Experience and Sample Projects

Completed and on-going several funded research projects sponsored with support from federal, state, local agencies and private companies within USA and also from abroad. In 2008, Dr Catbas was induced into Class of the University of Central Florida Research Millionaire's Club. Some of the recent sponsoring and partner agencies are: National Science Foundation (NSF); Federal Department of Transportation (DOT); Transportation Research Board (TRB) IDEA Program, Florida Department of Transportation (FDOT); Federal Highway Administration (FHWA); NASA FSGC; NASA KSC; NASA MSFC; Space Research Initiative; West-Nippon Expressway Authority, Japan; Transportation Technology Center Inc. (TTCI); Qatar National Science Foundation, Qatar; Scientific and Technological Council of Turkey etc.

- "Mobile Assessment of MAPS - Mobile Assessment for Civil Infrastructure Preservation using Structural Health Monitoring (SHM) and Building Information Modeling (BIM)" University of Central Florida, College of Engineering, PI Catbas (2023-2024) $63,000
- "Autonomous Infrastructure Monitoring and Assessment -An Interdisciplinary Research Equipment for Robotic Inspections", University of Central Florida, College of Engineering, PI Catbas (2021-2024) $49,228
- "Reliability-Based Bridge Inspection Framework using Non-destructive Evaluation (NDE) and Structural Health Monitoring (SHM) for Effective and Efficient Asset Maintenance", National Aeronautics and Space Administration (NASA), PI Catbas, $375K (2020-2023)
- "Structural Health Monitoring using Wireless Sensors" Sercel, France, $50K, PI Catbas (2021-2023)
- "Mixed Reality Assisted Infrastructure Inspection- Enhanced Infrastructure Inspection Using Mixed Reality and Artificial Intelligence" National Academy of Engineering NCHRP IDEA Program, $135K, PI Catbas (2020-2023)
- "A Cost-effective On-board Railway Track Condition Monitoring System by Using Sensor Fusion Technology" Association of American Railroads/Transportation Technology Center Inc. University Programs-Grand Challenge Research Topic, PI, $25,000
- "Bridge Health Monitoring Using Cameras and Computer Vision Methods" Contract Agency: National Science Foundation (NSF) Award Number: 1463493, 3 year project and ~$375K, PI: Dr. Catbas (2017-2019)
- "Indian Bridge Testing and Monitoring" Sanalil Construction/NASA, $22,756.00, PI: Catbas (2019-2020)
- "STEM TRansfer Students Opportunity for Nurtured Growth (STRONG)" Contract Agency: National Science Foundation (NSF) Award Number: 1463493, 5 year project and ~$1.0M, co-PI: Dr. Catbas, current
- "Utilization of Infrared Thermography Technologies for Bridge Condition Assessment and Management," Sponsor: NEXCO-West, West Nippon Expressway Co, Osaka, Japan, Principal Investigator, $400K, 2016-2018