

Lect. PhD MURAT BÜYÜK

Personal Information

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International Researcher IDs

ScholarID: [VkveAx4AAAAJ](https://orcid.org/0000-0002-6873-089X)

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Publons / Web Of Science ResearcherID: V-3452-2019

ScopusID: 57210823559

Biography

Dr. Buyuk is currently working as a lecturer at the Middle East Technical University - METU (www.metu.edu.tr) and a researcher at Sabanci University Nanotechnology Research and Application Center (SUNUM) (<https://sunum.sabanciuniv.edu>), a position he has been serving since January 2022.

Before that, he was a Research Assistant Professor at Sabanci University for about four years and was appointed as a researcher at the Integrated Manufacturing Technologies Research and Application Center (SU-IMC) / Composite Technologies Center of Excellence (<https://suimc.sabanciuniv.edu>). He served as the coordinator of the Mechanical Testing and Structural Health Monitoring Laboratory at SU IMC.

Before joining back to academia, Dr. Buyuk worked for Turkish Aerospace Industries Inc. (TAI) (www.tai.com.tr) as the chief scientist for crashworthiness/airworthiness-related R&D and as a Certification Verification Engineer. Dr. Buyuk worked as the Project Coordinator of the Automotive Test Center Project for the Turkish Standards Organization (TSE) (www.tse.org.tr), where he led efforts for establishing a proving ground for Whole Vehicle Type Approval and homologation.

Dr. Buyuk received his B.Sc. degree in Mechanical Engineering from Yildiz Technical University, Istanbul, Turkey. He received his M.Sc. degree in Design and Manufacturing Engineering from Gebze Technical University, Gebze, Turkey. He received his Ph.D. degree in Civil Engineering from The George Washington University, Washington D.C., USA. He worked for the National Crash Analysis Center (NCAC) during his doctoral studies as a research scientist and postdoctoral fellow.

Dr. Buyuk's research interests are in computational and experimental mechanics, transportation safety and security, structural impact, and crashworthiness, design and optimization. He has taught several courses and directed research on the fundamentals of Simulation-Based Engineering Science (SBES), computational mechanics, and dynamic modeling of materials and structures under extreme conditions such as crash, shock, and impact loading.

Education Information

Doctorate, George Washington University, Faculty of Natural Sciences, Civil Engineering, United States Of America 2003 - 2013

Postgraduate, Gebze Technical University, Faculty of Engineering, Mechanical Engineering, Turkey 2001 - 2003

Undergraduate, Yildiz Technical University, Faculty Of Mechanical Engineering, Department Of Mechanical Engineering, Turkey 1994 - 1999

Foreign Languages

English, C2 Mastery

Certificates, Courses and Trainings

Other, Aviation Safety and Security Program, George Washington University, 2008

Other, Modeling of Blast & Penetration: Applications to Protective Structures, Vehicles and Homeland Security Threats, Livermore Software Technology Corporation (LSTC), 2008

Other, Uncontained Engine Debris Damage Assessment Model (UEDDAM) Training, NAVAIR, NAWCWD, 2006

Other, ALE/Eulerian & Fluid/Structure Interaction, Livermore Software Technology Corporation (LSTC), 2006

Other, Material Modeling Using USERMAT, Livermore Software Technology Corporation (LSTC), 2006

Other, Advanced Training in Impact Analysis, Livermore Software Technology Corporation (LSTC), 2004

Other, Aircraft Accident Investigation, National Transportation Safety Board (NTSB), 2004

Dissertations

Doctorate, Development of a tabulated thermo-viscoplastic material model with regularized failure for dynamic ductile failure prediction of structures under impact loading , George Washington University, Faculty of Natural Sciences, Civil Engineering, 2013

Postgraduate, Finite Element Analysis and Optimum Design of Structures under Impact Loading , Gebze Technical University, Faculty of Engineering, Mechanical Engineering, 2003

Research Areas

Physics Analysis and Simulation Studies, Deformation Measurements, 3D-Modeling, Image Processing, Simulation, Modelling and Identification, Nonlinear Systems, Mathematical Techniques, Simulation and Modelling, Computational Model, Distributed Systems, Parallel Algorithms, Numerical Algorithms, Quantum Calculation, Mechanics of Solid Bodies, Data Structures, Computer Learning, Evolutionary Computing, Pattern Recognition and Image Processing, Neural Networks, Programming Languages, Biomedical Image Processing, Motion Analysis, Nanotechnology, Defense Technology, Transportation Engineering, Railways Engineering (railroads, metro, etc.), Traffic Engineering, Road Materials, Structural Engineering, Steel Structures, Composite materials, Material Mechanics, Nonlinear Programming, Linear Programming, Global Optimization, Heuristic Methods, Integer and Mixed Integer Programming, Simulation Optimization, Discrete Simulation, System Dynamics, Modelling and Analysis of Production Systems, Financial Models and Applications, Risk analysis, Reliability and Maintenance, Multi Criteria Decision Making, Decision Support Systems, Network Design, Pressure Vessels and Piping, Renewable Energy Systems, Alternative Energy Resources, Energy storage technologies, Hydrogen Technologies and Fuel Cells, Advanced Energy Technologies, Machine Elements, Machine Design, Computer Aided Design and Manufacturing, Predictive and Preventive Maintenance, NDT Engineering, Non-traditional manufacturing methods, Material, Plastic Forming Methods, Machining Methods, Transport Technique, Machine Dynamics, Mechanisms, Vehicle Systems Dynamics, Modeling and Simulation of Dynamic Systems, Solid Mechanics, Fracture Mechanics, Finite Element Methods, Biomechanics, Mechanical Testing, Continuous Mechanics, Computational fluid dynamics, Testing and Control of Materials, Mechanical Properties, Physical Properties, Electrical and Magnetic Properties, Chemical and Electrochemical Properties, Corrosion and Corrosion Protection, Nondestructive Testing, Composites, Intermetallics, Adhesion and Adhesives, Polymeric Materials, Biomaterials, Physical Metallurgy, Thermal Treatment, Material Characterization, Mechanical Metallurgy, Metallic Materials, Nanomaterials, Thermal Properties,

Structure-Property Relationship, Non-Ferrous Alloy Production, Electrometallurgy, Algebraic Geometry, Algebraic Topology, Field Theory and Polynomials, Commutative Rings and Algebras, Differential Equations, Differential Geometry, Linear and Multilinear Algebra: Matrix Theory, Functional Equations, Functional Analysis, Fourier Analysis, General Algebraic Systems, General Mathematics, General Topology, Geometry, Real Functions, Integral Equations, Integral Transformations, Computational Calculation, Statistics, Functions of a Complex Variable, Partial Differential Equations, Convex and Discrete Geometry, Probability Theory, Stochastic Processes, Optimization, Game Theory, Number Theory, Numerical Analysis, Approximations and Expansions, Statistical Analysis and Applications, Stars, Materials Science, Design Techniques, Vehicle Dynamics and Modeling, Deformation, Stress, Vibration and Noise Analysis, pyrotechnic, Test techniques, Metallic Materials, Non Metallic Materials Materials, Ground Tests - Structural Tests (Deformation, Stress, Vibration, Acoustics, etc.), Mathematical Modeling Techniques, Analysis techniques, Design techniques, Test Techniques, Deformation, Stress, Modal Analysis, Active thermal control, Fuel tank, Analysis techniques, Numerical modeling, Simulation

Academic Titles / Tasks

Lecturer PhD, Middle East Technical University, Faculty of Engineering, Department of Engineering Sciences, 2022 - Continues

Researcher, Sabanci University, Nanotechnology Research and Application Center (SUNUM), 2021 - Continues

Assistant Professor, Sabanci University, Integrated Manufacturing Technologies Research and Application Center (SU-IMC), 2017 - 2020

Visiting Lecturer, Near East University, Department of Automotive Engineering, 2015 - 2017

Visiting Lecturer, Nisantasi University, Civil Engineering, 2016 - 2016

Visiting Lecturer, Yalova University, Transportation Engineering, 2016 - 2016

Visiting Lecturer, Istanbul Gelisim University, Faculty Of Engineering And Architecture, Civil Engineering (English), 2016 - 2016

Research Assistant PhD, The George Washington University, National Crash Analysis Center, 2013 - 2014

Visiting Lecturer, Bahcesehir University, Department of Transportation Engineering, 2013 - 2014

Research Assistant, The George Washington University, National Crash Analysis Center, 2003 - 2013

Research Assistant, Gebze Technical University, Department of Design & Manufacturing Engineering, 2000 - 2013

Courses

Mathematics for Engineers , Undergraduate, 2023 - 2024, 2022 - 2023, 2021 - 2022

Computing Methods in Engineering , Undergraduate, 2022 - 2023, 2021 - 2022

Mechanical Behaviour of Materials , Postgraduate, 2018 - 2019

Strength of Materials II , Undergraduate, 2016 - 2017

Vehicle Body Design, Undergraduate, 2017 - 2018, 2016 - 2017, 2015 - 2016

Vehicle Component Design , Undergraduate, 2017 - 2018, 2016 - 2017, 2015 - 2016, 2014 - 2015

Fuel Cells , Undergraduate, 2016 - 2017

Structural Analysis I, Undergraduate, 2016 - 2017

Structural Analysis II , Undergraduate, 2016 - 2017

Strength of Materials I , Undergraduate, 2016 - 2017

Vehicle Dynamics , Undergraduate, 2017 - 2018, 2016 - 2017, 2014 - 2015

Computational Applications in Civil Engineering , Undergraduate, 2016 - 2017

Traffic and Road Safety , Undergraduate, 2016 - 2017

Transportation 2, Undergraduate, 2016 - 2017

Vehicle Production Processes and Systems, Undergraduate, 2015 - 2016

Internal Combustion Engines, Undergraduate, 2016 - 2017

Introduction to Civil Engineering, Undergraduate, 2016 - 2017

Introduction to Automotive Engineering , Undergraduate, 2014 - 2015

Roadside Hardware Design, Postgraduate, 2013 - 2014

Advising Theses

Büyük M., Multidisciplinary investigation of c-type composite sandwich radome panels within the scope of acoustic emission based damage characterization and electromagnetic transmission performance, Postgraduate, F.Uzun(Student), 2020

Büyük M., Development of in-situ thermal monitoring system for selective laser sintering to evaluate nesting design, Postgraduate, D.Ünal(Student), 2020

Advising Graduates (Non-Thesis)

Büyük M., Concept Car Design, Masters (Non-Thesis), A.Almasalmah(Student), 2016

Büyük M., Concept Car Design, Masters (Non-Thesis), H.Ayman(Student), 2016

Büyük M., The Turbocharger, Masters (Non-Thesis), P.Azor(Student), 2016

Büyük M., Electric Vehicle Design, Masters (Non-Thesis), K.Şişmanoğlu(Student), 2016

Büyük M., Crash of Pick-up Suspension: Incorporating Suspension Failure in a Vehicle Finite Element Model to Improve Simulations of Roadside Hardware Impacts, Masters (Non-Thesis), S.Dolci(Student), 2012

Büyük M., A Study of the Gurson Damage Model and Numerical Simulation of Failure, Masters (Non-Thesis), T.M. (Student), 2008

Büyük M., Development of a Numerical Model for Oxi-hydrogen Detonation in Pipes, Masters (Non-Thesis), B.Petersen(Student), 2006

Büyük M., Development of a Numerical Model for Split Hopkinson Bar (SHB) Testing, Masters (Non-Thesis), C.Loeffler(Student), 2006

Büyük M., An Inverse Approach to Identify the Constitutive Model Parameters of Aluminum Honeycombs, Masters (Non-Thesis), T.Kernstock(Student), 2005

Büyük M., Development of a High Strain-rate Dependent Vehicle Model, Masters (Non-Thesis), M.Dietenberger(Student), 2005

Jury Memberships

Post Graduate, Post Graduate, Afyon Kocatepe University, December, 2022

Post Graduate, Post Graduate, Istanbul Technical University, June, 2020

Doctorate, Doctorate, Istanbul Technical University, May, 2019

Post Graduate, Post Graduate, Istanbul Technical University, May, 2019

Doctorate, Doctorate, Gebze Technical University, May, 2019

Post Graduate, Post Graduate, Istanbul Technical University, May, 2018

Post Graduate, Post Graduate, Gebze Technical University, May, 2018

Post Graduate, Post Graduate, Gazi University, May, 2015

Post Graduate, Post Graduate, Bahcesehir University, May, 2014

Published journal articles indexed by SCI, SSCI, and AHCI

- I. **Development and validation of a digital twin of the human lower jaw under impact loading by using non-linear finite element analyses**

Demir O., Uslan I., BÜYÜK M., SALAMCI M. U.

Journal of the Mechanical Behavior of Biomedical Materials, vol.148, 2023 (SCI-Expanded)

- II. **A novel modular shallow mounted bollard system design and finite element performance analysis in ensuring urban roadside safety**
Apak M. Y., Ergün M., ÖZEN H., Buyuk M., Yumrutas H. I., Ozcanan S., Atahan A. O.
PROCEEDINGS OF THE INSTITUTION OF MECHANICAL ENGINEERS PART D-JOURNAL OF AUTOMOBILE ENGINEERING, vol.237, no.13, pp.3146-3164, 2023 (SCI-Expanded)
- III. **An Experimental Investigation of the Influence of the State of Stress on the Ductile Fracture of 2024-T351 Aluminum**
Seidt J. D., Park C., Buyuk M., Lowe R. L., Wang L., Carney K. S., Du Bois P., Gilat A., Kan C.
JOURNAL OF ENGINEERING MATERIALS AND TECHNOLOGY-TRANSACTIONS OF THE ASME, vol.144, no.4, 2022 (SCI-Expanded)
- IV. **Finite element simulation and failure analysis of fixed bollard system according to the PAS 68:2013 standard**
Apak M. Y., Ergün M., ÖZEN H., Buyuk M., Ozcanan S., Atahan A. O., Yumrutas H. I.
ENGINEERING FAILURE ANALYSIS, vol.135, 2022 (SCI-Expanded)
- V. **Low velocity drop weight impact behaviour of Al₂O₃-Ni-ZrO₂ and Al₂O₃-Ni-Cr₂O₃ ceramic composites**
Yildiz B. K., Buyuk M., Tur Y. K.
PROCESSING AND APPLICATION OF CERAMICS, vol.15, no.2, pp.154-163, 2021 (SCI-Expanded)
- VI. **Determination of optimum post embedment depth for C120 steel posts using field and full scale crash test**
Atahan A. O., Buyuk M., Ornek M., Erdem M., Turedi Y.
INTERNATIONAL JOURNAL OF CRASHWORTHINESS, vol.24, no.5, pp.533-542, 2019 (SCI-Expanded)
- VII. **SOIL BASED DESIGN OF HIGHWAY GUARDRAIL POST DEPTHS USING PENDULUM IMPACT TESTS**
Ornek M., Atahan A. O., Turedi Y., Erdem M. M., Buyuk M.
ACTA GEOTECHNICA SLOVENICA, vol.16, no.2, pp.77-89, 2019 (SCI-Expanded)
- VIII. **A hybrid damage assessment for E-and S-glass reinforced laminated composite structures under in-plane shear loading**
YILMAZ Ç., Akalin C., Gunal I., Celik H., Buyuk M., Suleman A., YILDIZ M.
COMPOSITE STRUCTURES, vol.186, pp.347-354, 2018 (SCI-Expanded)
- IX. **Explicit Finite-Element Analysis of 2024-T3/T351 Aluminum Material under Impact Loading for Airplane Engine Containment and Fragment Shielding**
Buyuk M., Kan S., Loikkanen M. J.
JOURNAL OF AEROSPACE ENGINEERING, vol.22, no.3, pp.287-295, 2009 (SCI-Expanded)
- X. **Generalized, Three-Dimensional Definition, Description, and Derived Limits of the Triaxial Failure of Metals**
Carney K. S., DuBois P. A., Buyuk M., Kan S.
JOURNAL OF AEROSPACE ENGINEERING, vol.22, no.3, pp.280-286, 2009 (SCI-Expanded)
- XI. **Automated design of threats and shields under hypervelocity impacts by using successive optimization methodology**
Buyuk M., Kurtaran H., Marzougui D., Kan C. D.
INTERNATIONAL JOURNAL OF IMPACT ENGINEERING, vol.35, no.12, pp.1449-1458, 2008 (SCI-Expanded)
- XII. **Design automation of a laminated armor for best impact performance using approximate optimization method**
Kurtaran H., Buyuk M., Eskandarian A.
INTERNATIONAL JOURNAL OF IMPACT ENGINEERING, vol.29, no.1-10, pp.397-406, 2003 (SCI-Expanded)
- XIII. **Ballistic impact simulation of GT model vehicle door using finite element method**
Kurtaran H., Buyuk M., Eskandarian A.
THEORETICAL AND APPLIED FRACTURE MECHANICS, vol.40, no.2, pp.113-121, 2003 (SCI-Expanded)

Articles Published in Other Journals

- I. **Impact Performance Evaluation of a Crash Cushion Design Using Finite Element Simulation and Full-Scale Crash Testing**
Buyuk M., Atahan A. O., Kurucuoglu K.
SAFETY, vol.4, no.4, 2018 (ESCI)
- II. **Using forefoot acceleration to predict forefoot trauma in frontal crashes**
Büyük M., Ozkan D., Morgan R., Digges K.
vol.0, no.0, 2007 (Conference Book)

Refereed Congress / Symposium Publications in Proceedings

- I. **Observation of damage accumulation under in-plane shear loading**
Büyük M.
NATO S&T specialist's workshop (AVT-305), Athens, Greece, 15 December 2018
- II. **Safety of road work zones: European and the U.S. perspective**
Atahan A. O., Buyuk M., Malkoc G., Diez J.
Proceedings of 6th Eurasphalt & Eurobitume Congress, Praha, Czech Republic, 1 - 03 June 2016
- III. **Explicit finite element analysis of 2024-T3/T351 aluminum material under impact loading for airplane engine containment and fragment shielding**
Buyuk M., Kan S., Loikkanen M. J.
Earth and Space Conference 2008: Proceedings of the 11th Aerospace Division International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, Long Beach, CA, United States Of America, 3 - 05 March 2008, vol.323
- IV. **A Multi-Objective Discrete Design Optimization Algorithm for Portable Concrete Barriers by Coupling Grey Relational Analysis with Successive Taguchi Method**
Büyük M.
Transportation Research Board 87th Annual Meeting, Washington, United States Of America, 13 - 17 January 2008
- V. **Safety Performance Evaluation of Portable Concrete Barriers**
Büyük M.
Transportation Research Board 87th Annual Meeting, Washington, United States Of America, 13 - 17 January 2008
- VI. **A generalized, three dimensional definition, description and derived limits of the triaxial failure of metals**
Carney K. S., DuBois P. A., Buyuk M., Kan S.
Earth and Space Conference 2008: Proceedings of the 11th Aerospace Division International Conference on Engineering, Science, Construction, and Operations in Challenging Environments, Long Beach, CA, United States Of America, 3 - 05 March 2008, vol.323
- VII. **Using forefoot acceleration to predict forefoot trauma in frontal crashes**
Buyuk M., Ozkan D., Morgan R. M., Digges K. H.
2007 World Congress, Detroit, MI, United States Of America, 16 - 19 April 2007
- VIII. **Approximate optimization method as an efficient design methodology for armors under ballistic impacts**
Buyuk M., Kurtaran H., Kan C., Marzougui D.
46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Austin, TX, United States Of America, 18 - 21 April 2005, vol.10, pp.6529-6538
- IX. **Determination of the ballistic performance of a cold-rolled, deep-drawing sheet metal**
Buyuk M., Durmus A., Musayeva E., Ulku S., Kan C., Marzougui D.
46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, Austin, TX, United States Of America, 18 - 21 April 2005, vol.10, pp.6520-6528
- X. **Development of a high strain-rate dependent vehicle model**

Büyük M.

LS-Dyna Anwenderforum, Bamberg, Germany, 20 - 21 October 2005

XI. Dynamic behaviour of a laminated balsa beam under impulsive load

Türkmen H. S., Eren E., Buyuk M.

9th Biennial International Conference on Engineering, Construction and Operations in Challenging Environment, Texas, United States Of America, 7 - 10 March 2004, pp.526-531

Other Publications

I. Composite Technologies Roadmap

Büyük M.

Technical Report, 2019

II. Development of a New Metal Material Model in LS-DYNA, PART 2: Development of a Tabulated Thermo-Viscoplastic Material Model with Regularized Failure for Dynamic Ductile Failure Prediction of Structures under Impact Loading

Büyük M.

Technical Report, 2014

III. Explicit Finite Element Analysis of 2024-T3/T351 Aluminum Material under Ballistic Impact Loading for Airplane Engine Containment and Fragment Shielding

Büyük M.

Technical Report, 2008

Supported Projects

Büyük M., TUBITAK Project, Concurrent Structural Health Monitoring and Warning System, 2020 - 2021

Büyük M., Company, Polymer Matrix Composite Leaf Spring Design Project with Finite Element Analysis, 2020 - 2021

Büyük M., TUBITAK Project, Developing a Numerical Method for Calculating Residual Stress After Plastic Deformation Using Finite Element Method of Crystal Plasticity and Automotive Application, 2018 - 2021

Büyük M., TUBITAK Project, Lightening the Steel Body Connector by Optimizing the Design and Using Thermoplastic Carbon Composites (TFP) to be Obtained as a result of Innovative Manufacturing Techniques, 2018 - 2021

Büyük M., TUBITAK Project, Monitoring of Micro-Damage Initiation/Accumulation Under Load Using Hybrid Methods of Fiber Reinforced Polymers with Different Stacking Arrays and Carbon Fiber Types, 2018 - 2021

Büyük M., TUBITAK Project, Lightweight Design, Analysis, Optimization, and Certification by Analysis of Aviation Seats, 2018 - 2020

Büyük M., TUBITAK Project, National Integrated Light Class Tactical Wheeled Vehicle Project, 2017 - 2020

Büyük M., TUBITAK Project, Production and Characterization of Alumina Ceramic with Oxide Ceramic and Metal Phase Additives for Light Armor Applications, 2018 - 2019

Büyük M., Company, Determination of Fundamental Methods and Approaches to Perform Validated Finite Element Analysis of Parts to be Produced with Composite Material Technologies, 2018 - 2019

Büyük M., Municipality, Test, Analysis and Design of Impact Damping Barrier, 2018 - 2019

Büyük M., TUBITAK Project, Investigation of the Effect of Soil Properties on the Performance of Guardrail Posts Using Field Tests and Numerical Analysis, 2014 - 2016

Büyük M., Project Supported by Public Organizations in Other Countries, Explicit Finite Element Analysis (FEA) of Uncontained Aircraft Engine Failure, 2004 - 2013

Büyük M., Project Supported by Public Organizations in Other Countries, : Development of Guidance for the Selection, Use, and Maintenance of Cable Barrier Systems, 2008 - 2011

Project Supported by Public Organizations in Other Countries, : Cooperative Agreement Between FHWA / National Highway Traffic Safety Administration (NHTSA) and NCAC on Highway, Infrastructure and Occupant Safety Research, 2003 - 2008

Memberships / Tasks in Scientific Organizations

AFB20 (1) - Roadside Safety Design Subcommittee on Computational Mechanics, Transportation Research Board (TRB), Member, 2014 - Continues, United States Of America

AFB20 (2) - Roadside Safety Design Subcommittee on International Research, Transportation Research Board (TRB), Member, 2004 - Continues, United States Of America

Tasks In Event Organizations

Büyük M., Composite Technologies Roadmap, Workshop Organization, Turkey, Aralık 2019

Büyük M., The 10th U.S. National Congress on Computational Mechanics, Scientific Congress, United States Of America, Temmuz 2009

Büyük M., The 9th U.S. National Congress on Computational Mechanics, Scientific Congress, United States Of America, Temmuz 2007

Metrics

Publication: 29

Citation (WoS): 193

Citation (Scopus): 263

H-Index (WoS): 7

H-Index (Scopus): 7

Congress and Symposium Activities

2nd International Mediterranean Science and Engineering Congress (IMSEC 2017), Invited Speaker, Adana, Turkey, 2017

Non Academic Experience

Company, Infinitdynamics Ltd. Şti, R&D

Company, Turkish Aerospace Industries Inc., Indigenous Helicopter Project - GÖKBEY

Other Public Institution, Turkish Standards Institute (TSE), Transportation and Logistics Systems Center

Company, Canovate Group, Electronics Inc., , R&D