Murat Büyük, Ph.D.

Assistant Professor of Mechanical Engineering

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**PERSONAL**

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| Date of Birth | 26th April 1976 |
| **Place of Birth** | Kars,Turkey |

# EDUCATION

|  |  |
| --- | --- |
| 2013 | The George Washington University  Civil Engineering, Applied Mechanics, Ph.D. |
| **2003** | Gebze Technical University  Mechanical Engineering, Applied Mechanics, M.Sc. |
| **1999** | Yıldız Technical University  Mechanical Engineering, B.Sc. |

# ACADEMIC POSITIONS

|  |  |
| --- | --- |
| 2024 | Assistant Professor, Department of Mechanical Engineering, Atilim University, Türkiye |
| 2022-2024 | Lecturer, Department of Engineering Sciences, Middle East Technical University, Türkiye |
| 2021-2022 | Researcher, Sabancı University Nanotechnology Research and Application Center (SUNUM), Türkiye |
| **2017-2021** | Assistant Professor, Sabancı University, Integrated Manufacturing Technologies Research and Application Center (SU-IMC),  Composite Technologies Center of Excellence, Türkiye |
| **2014-2017** | Visiting Professor, Near East University, Department of Automotive Engineering, TRNC |

### HONORS&AWARDS

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| --- | --- |
| 1 | Alex Charters Student Scholar, Hypervelocity Impact Society (HVIS), (2007) |
| **2** | Graduate Student Scholarship, National Science Foundation (NSF), (2005, 2007) |
| **3** | Graduate Student Scholarship, Federal Aviation Administration (FAA), (2005) |
| **4** | Research Fellowship, George Washington University, National Crash Analysis Center (NCAC),(2003 – 2012) |
| **5** | Graduate Student Scholarship, Scientific and Technological Research Council of Turkey (TUBITAK), (2003) |

**RESEARCH INTERESTS**

|  |  |
| --- | --- |
| 1 | Computational Mechanics  Continuum-Solid Mechanics  Finite Element Analysis  Structural Impact  Crashworthiness  Transportation Safety |
| **2** | High Performance Computing  Simulation-Based Engineering Science  Digital Twins |
| **3** | Computing Methods in Engineering  Mathematics for Engineers |

**PROFESSIONAL SERVICE**

|  |  |
| --- | --- |
| 1 | Co-organiser, Minisymposium on Application of Mesh-free Methods: Solving Practical Problems, with Dr. C.T. Wu (LSTC), The 10th U.S. National Congress on Computational Mechanics, Columbus, OH, (2009). |
| 2 | Co-organiser, Minisymposium on Advances and Applications of Mesh-free and Extended Finite Element Methods, with Dr. C.T. Wu (LSTC), The 9th U.S. National Congress on Computational Mechanics, San Francisco, CA, (2007). |
| **3** | Committee member, W29 - World Forum for Harmonization of Vehicle Regulations\ Working Party on Passive Safety (GRSP) , (2003-) |
| **4** | Committee member, AFB20 (1) - Roadside Safety Design Subcommittee on Computational Mechanics, Transportation Research Board (TRB), (2003-) |
| **5** | Committee member, AFB20 (2) - Roadside Safety Design Subcommittee on International Research, Transportation Research Board, (2003-) |

**PUBLICATIONS**

|  |  |
| --- | --- |
| **1** | Demir, O., Uslan, I., **Buyuk**, M., Salamci, M. U., Development and Validation of a Digital Twin of The Human Lower Jaw Under Impact Loading by Using Non-Linear Finite Element Analyses. Journal of the Mechanical Behavior of Biomedical Materials, December (2023), Vol. 148, 106207.  https://doi.org/10.1016/j.jmbbm.2023.106207 |
| **2** | Apak, M. Y., Ergun, M., Ozen, H., **Buyuk**, M., Yumrutas, H. I., Ozcanan, S., Atahan, A. O., A Novel Modular Shallow Mounted Bollard System Design and Finite Element Performance Analysis in Ensuring Urban Roadside Safety. Proceedings of The Institution of Mechanical Engineers Part D-Journal of Automobile Engineering, August (2022),1–19.  https://doi.org/10.1177/09544070221125534 |
| **3** | Seidt, J., Park, C.-K., **Buyuk**, M., Lowe, R., Wang, L., Carney, K. S., DuBois, P., Gilat, A., Kan, C.-D., An Experimental Investigation of the Influence of the State of Stress on the Ductile Fracture of 2024-T351 Aluminum, Journal of Engineering Materials and Technology - Transactions of the ASME, October (2022), Vol. 144, 041006-1-13.  https://doi.org/10.1115/1.4054895 |
| **4** | Apak, M. Y., Ergun, M., Ozen, H., **Buyuk**, M., Ozcanan, S., Atahan, A. O., Yumrutas, H. I., Finite Element Simulation and Failure Analysis of Fixed Bollard System According to the PAS 68:2013 Standard. Engineering Failure Analysis, May (2022), Vol. 135, 106151.  https://doi.org/10.1016/j.engfailanal.2022.106151 |
| 5 | Yıldız, B. K., **Büyük**, M., Tür, Y. K. Low Velocity Drop Weight Impact Behaviour of Al2O3-Ni-ZrO2 and Al2O3-Ni-Cr2O3 Ceramic Composites. Processing and Application of Ceramics, 15 (2), (2021), 154–163.  https://doi.org/10.2298/PAC2102154K |
| 6 | Örnek, M., Atahan, A. O., Türedi, Y., Erdem M. M. and **Büyük** M. Soil Based Design of Highway Guardrail Post Depths Using Pendulum Impact Tests. Acta Geotechnica Slovenica, 2019/2, (2019), 77-89.  https://doi.org/10.18690/actageotechslov.16.2.77-89.2019 |
| 7 | Atahan, A. O., **Büyük**, M., Örnek, M., Erdem M., and Türedi, Y. Determination of Optimum Post Embedment Depth for C120 Steel Posts Using Field and Full-Scale Crash Test. International Journal of Crashworthiness, 24, 5 (2019), 1-10.  https://doi.org/10.1080/13588265.2018.1479499 |
| **8** | **Buyuk**, M., Atahan, A. O., and Kurucuoğlu, K. Impact Performance Evaluation of a Crash Cushion Design Using Finite Element Simulation and Full-Scale Crash Testing. Safety, 4(4), 48, (2018), 1-11.  http://dx.doi.org/10.3390/safety4040048 |
| **9** | Yilmaz, C., Akalin, C., Gunal, I., Celik, H., **Buyuk**, M., Suleman, A., and Yildiz, M. A Hybrid Damage Assessment for E- and S-Glass Reinforced Laminated Composite Structures under In-Plane Shear Loading.  https://doi.org/10.1016/j.compstruct.2017.12.023 |
| **10** | Carney, K. S., Du Bois, P. A., **Buyuk**, M., and Kan, S. Generalized, Three-Dimensional Definition, Description, and Derived Limits of the Triaxial Failure of Metals. Journal of Aerospace Engineering, 22, 3 (2009), 280-286.  http://dx.doi.org/10.1061/(ASCE)0893-1321(2009)22:3(280) |
| **11** | **Buyuk**, M., Kan, C. D., and Loikkanen, M. J. Explicit Finite Element Analysis of 2024-T3/T351 Aluminum Material under Impact Loading for Airplane Engine Containment and Fragment Shielding. Journal of Aerospace Engineering, 22, 3 (2009), 287-295.  http://dx.doi.org/10.1061/(ASCE)0893-1321(2009)22:3(287) |
| **12** | **Buyuk**, M., Kurtaran, H., Marzougui, D., and Kan, C.D. Automated Design of Threats and Shields under Hypervelocity Impacts by Using Successive Approximate Optimization Methodology. International Journal of Impact Engineering, 35, 12 (2008), 1449-1458.  http://dx.doi.org/10.1016/j.ijimpeng.2008.07.057 |
| **13** | Kurtaran, H., **Buyuk**, M., and Eskandarian, A. Design Automation of a Laminated Armor for Best Impact Performance Using Approximate Optimization Method. International Journal of Impact Engineering, 29, (2003), 397-406.  http://dx.doi.org/10.1016/j.ijimpeng.2003.09.036 |
| **14** | Kurtaran, H., **Buyuk**, M., and Eskandarian, A. Ballistic Impact Simulation of GT Model Vehicle Door Using Finite Element Method. Theoretical and Applied Fracture Mechanics, 40, (2003), 113-121.  http://dx.doi.org/10.1016/S0167-8442(03)00039-9 |

**PROJECTS**

|  |  |
| --- | --- |
| 1 | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Eş Zamanlı Yapısal Davranış İzleme ve Uyarı Sistemi  (Concurrent Structural Health Monitoring and Warning System)  Period: 01 Jan 2020 - 30 June 2021  Funding Agency: TÜBİTAK-1511: TEYDEB |
| 2 | Affiliation: Sabancı University  Position: **PI**  Project Title: Sonlu Elemanlar Analizi ile Polimer Matris Kompozit Yaprak Yay Tasarımı Projesi  (Polymer Matrix Composite Leaf Spring Design Project with Finite Element Analysis)  Period: 2020-2021  Funding Agency: FORD Otosan A.Ş. |
| **3** | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Milli Entegre Hafif Sınıf Taktik Tekerlekli Araç Projesi  (National Integrated Light Class Tactical Wheeled Vehicle Project)  Period: 01.08.2017 - 29.09.2020  Funding Agency: TÜBİTAK-1501: TEYDEB |
| **4** | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Hafif Zırh Uygulamaları için Alümina Seramiğinin Oksit Seramik ve Metal Faz Katkısıyla Üretilmesi ve Karakterizasyonu  (Production and Characterization of Alumina Ceramic with Oxide Ceramic and Metal Phase Additives for Light Armor Applications)  Period : 15.11.2018 - 15.11.2019  Funding Agency: TÜBİTAK-1002: 118M806 |
| **5** | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Kristal Plastisite Sonlu Eleman Metodu Kullanılarak Plastik Deformasyon Sonrası Oluşan Kalıntı Gerilimlerin Hesaplanması için Nümerik Yöntem Geliştirilmesi ve Otomotiv Uygulaması  (Developing a Numerical Method for Calculating Residual Stress After Plastic Deformation Using Finite Element Method of Crystal Plasticity and Automotive Application)  Period : 01.11.2018 - 2021  Funding Agency: TÜBITAK-1001: 118M285 |
| **6** | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Farklı İstifleme Dizilerine ve Karbon Elyaf Tiplerine Sahip Fiber Takviyeli Polimerlerin Yük Altındaki Mikro-Hasar Oluşumunun/Birikiminin Hibrit Yöntemler Kullanarak İzlenmesi  (Monitoring of Micro-Damage Initiation/Accumulation Under Load Using Hybrid Methods of Fiber Reinforced Polymers with Different Stacking Arrays and Carbon Fiber Types)  Period : 01.09.2018 - 2021  Funding Agency: TÜBİTAK-1001: 217M211 |
| **7** | Affiliation: Sabancı University  Position: **Advisor**  Project Title: Çelik Gövde Bağlantı Parçasının Tasarımı Eniyileştirilerek Yenilikçi İmalat Teknikleri Sonucunda Elde Edilecek Termoplastik Karbon Kompozitlerin (TFP) Kullanılması İle Hafifleştirilmesi  (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)  Period : 01.10.2018 - 2021  Funding Agency: TÜBİTAK-1511: TEYDEB 1180152 |
| **8** | Affiliation: Sabancı University  Position: **PI**  Project Title: Darbe Sönümlendirici Bariyer Test, Analiz ve Tasarımı  (Test, Analysis and Design of Impact Damping Barrier)  Period : 20.02.2018 - 31.07.2019  Funding Agency: İGDAŞ: E.D.KM-18-01812 |
| **9** | Affiliation: Sabancı University  Position: **PI**  Project Title: Kompozit Malzeme Teknolojileri ile Üretilecek Parçaların Doğrulanmış Sonlu Elemanlar Analizlerini Gerçekleştirmek Üzere Temel Yöntem ve Yaklaşımların Belirlenmesi  (Determination of Fundamental Methods and Approaches to Perform Validated Finite Element Analysis of Parts to be Produced with Composite Material Technologies)  Period : 03.09.2018 - 07.07.2019  Funding Agency: BORUSAN: E.A.KM-18-01869 |
| **10** | Affiliation: Sabancı University  Position: **Researcher**  Project Title: Otokorkuluk Dikmelerinin Performansına Zemin Özelliklerinin Etkisinin Arazi Deneyleri ve Sayısal Analizler Kullanılarak İncelenmesi  (Investigation of the Effect of Soil Properties on the Performance of Guardrail Posts Using Field Tests and Numerical Analysis)  Period : 01.04.2014 - 01.04.2016  Funding Agency: TÜBİTAK-1001: 213M516 |

# CONFERENCE PRESENTATIONS

|  |  |
| --- | --- |
| 1 | Savas V. E., **Buyuk** M., The Effect of Metal Forming on Crashworthiness., **19th International Conference on Machine Design and Production**  **(UMTIK 2024)**, Ankara, Turkey |
| 2 | Yilmaz, C., Akalin, C., Gunal, I., Celik, H., **Buyuk**, M., Suleman, A., and Yildiz, M. Observation of Damage Accumulation under In-plane Shear Loading. **NATO S&T specialist’s workshop (AVT-305), Sensing Systems for Integrated Vehicle Health Management for Military Vehicles, Sensing Systems for Integrated Vehicle Health Management for Military Vehicles**, 15 December 2018, Athens, Greece. |
| 3 | Aydin, Ö. F., Malkoç, G., **Büyük**, M., Diez, J. and Atahan, A. O. Safety of Road Work Zones: European and the U.S. Perspective. **E&E Congress 2016, 6th Eurasphalt & Eurobitume Congress**, 1-3 June 2016, Prague, Czech Republic. |
| 4 | **Buyuk**, M., Marzougui, D., and Kan, C. D. Safety Performance Evaluation of Portable Concrete Barriers with Different Design Combinations by using Modular Finite Element Modeling Approach. **International Crashworthiness Conference**, 22-25 July 2008, Kyoto, Japan. |
| 5 | Carney, K. S., Du Bois, P. A., **Buyuk** M., and Kan S. A Generalized, Three Dimensional Definition, Description and Derived Limits of the Triaxial Failure of Metals. **Earth & Space 2008, ASCE 11th Aerospace Division International Conference on Engineering, Construction and Operations in Challenging Environments**, 3-5 March 2008, Long Beach, CA. |
| 6 | **Buyuk**, M., Kan, C. D., and Loikkanen, M. J. Explicit Finite Element Analysis of 2024-T3/T351 Aluminum Material under Impact Loading for Airplane Engine Containment and Fragment Shielding. **Earth & Space 2008, ASCE 11th Aerospace Division International Conference on Engineering, Construction and Operations in Challenging Environments**, 3-5 March 2008, Long Beach, CA. |
| 7 | **Buyuk**, M., Kurtaran, H., Marzougui, D., and Kan, C. D. A Multi-Objective Discrete Design Optimization Algorithm for Portable Concrete Barriers by Coupling Grey Relational Analysis with Successive Taguchi Method. **TRB 87th Annual Meeting**, 13-17 January 2008, Washington, D.C. |
| 8 | Marzougui, D., **Buyuk**, M., Kan, C. D., and Opiela, K. Safety Performance Evaluation of Portable Concrete Barriers. **TRB 87th Annual Meeting**, 13-17 January 2008, Washington, D.C. |
| **9** | **Buyuk**, M., Kurtaran, H., Marzougui, D., and Kan, C.D. Automated Design of Threats and Shields under Hypervelocity Impacts by using Successive Approximate Optimization Methodology. **Hypervelocity Impact Symposium**, 23-27 September 2007, Williamsburg, Virginia. |
| **10** | **Buyuk**, M., Demircan, D. O., Morgan, R. M., Digges, K. H., and Smith, B. Using Forefoot Acceleration to Predict Forefoot Trauma in Frontal Crashes. **SAE 2007 World Congress**, 16-19 April 2007, Cobo Center, Detroit, Michigan. |
| **11** | Dietenberger, M., **Buyuk**, M., and Kan, C. D. Development of a High Stain-Rate Dependent Vehicle Model. **4th German LS-DYNA Forum**, 20-21 Oct 2005, Bamberg, Germany. |
| **12** | **Buyuk**, M., Kildare, S., Kan, C. D., and Marzougui, D. Moving Beyond the Finite Elements: A Comparison Between Finite Element Methods and Meshless Methods for Modeling Honeycomb Materials and Simulating Side Impact Moving Deformable Barriers (MDBs). **5th European LS-DYNA Conference**, 25-26 May 2005, Birmingham, UK. |
| **13** | Loikkanen, M. J., **Buyuk**, M., Kan, C. D., and Meng, N. A Computational and Experimental Analysis of Ballistic Impact to Sheet Metal Aircraft Structures. **5th European LS-DYNA Conference**, 25-26 May 2005, Birmingham, UK. |
| **14** | **Buyuk**, M., Kurtaran, H., Kan, C. D., and Marzougui, D. Approximate Optimization Method as an Efficient Design Methodology for Armors under Ballistic Impacts. **1st AIAA Multidisciplinary Design Optimization Specialist Conference**, 18-21 Apr 2005, Austin, Texas. |
| **15** | Durmus, A., **Buyuk**, M., Musayev, E., Ulku, S., Kan, C. D., and Marzougui, D. Determination of the Ballistic Performance of a Cold-Rolled, Deep-Drawing Sheet Metal. **46th AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics & Materials Conference**, 18-21 Apr 2005, Austin, Texas. |
| **16** | **Buyuk**, M., Kurtaran, H., and Bedewi, N. E. Prediction of Bend Allowance in Air-Bending of Sheet Metals Using Artificial Neural Network. **3rd International Conference and Exhibition on Design and Manufacturing of Dies and Molds**, 17-19 June 2004, Bursa, Turkey. |
| **17** | **Buyuk**, M., Kan, C. D., Bedewi, N. E., Durmus, A., and Ulku, S. Moving Beyond the Finite Elements: A Comparison Between Finite Element Methods and a Meshless Method for a Ballistic Impact Simulation. **8th International LS-DYNA Conference**, 3-4 May 2004, Detroit, Michigan. |
| **18** | Turkmen, H. S., Eren, E., and **Buyuk**, M. Dynamic Behaviour of a Laminated Balsa Beam under Impulsive Load. Earth & Space 2004, **ASCE 9th Aerospace Division International Conference on Eng., Construction and Operations in Challenging Environments**, 7-10 March 2004, League City-Houston, Texas. |
| **19** | Kurtaran, H., **Buyuk**, M., and Eskandarian, A. Design Automation of a Laminated Armor for Best Hypervelocity Impact Performance using Approximate Optimization Method. **Hypervelocity Impact Symposium**, 8-11 December 2003, Noordwijk, The Netherlands. |
| **20** | **Buyuk**, M., Kurtaran, H., Turkmen, H. S. The Effect of Material Model Selection on Ballistic Impact Simulations. **9th International Conference on the Mechanical Behavior of Materials**, 25-29 May 2003, Geneva, Switzerland. |
| **21** | **Buyuk**, M., Kurtaran, H., Turkmen, H. S., and Mecitoglu, Z. Influence of Damping on the Response of a Beam-to-Plate Connection under Mass Drop. **9th International Conference on The Mechanical Behavior of Materials**, 25-29 May 2003, Geneva, Switzerland. |
| **22** | Kurtaran, H., and **Buyuk**, M. Behavior of a Refinery Tank Containing Oil under Weight Loading. **GAP 2002 4th Engineering Congress**, 6-8 June 2002, Sanliurfa, Turkey. |
| **23** | Ozcelik, B., and **Buyuk**, M. An Experimental Approach for Determining the Bend Allowance in Air-Bending Process. **2nd International Conference and Exhibition on Design and Manufacturing of Dies and Molds**, 2001, Kusadasi-Izmir, Turkey. |
| **24** | Ozcelik, B., Erzurumlu, T., and **Buyuk**, M. Finite Elements Analysis and Application Work for a Plastic Injected Experimental Part. **International Symposium on Intelligent Manufacturing Systems**, 2001, Kocaeli, Turkey. |

**CITATIONS**

|  |  |
| --- | --- |
| Sum of times cited without self-citations (ISI Web of Science): | 217 |
| H-index (ISI Web of Science): | H7 |

**COURSES GIVEN**

|  |  |
| --- | --- |
| 1 | ME 201 Statics (Atılım University) |
| **2** | ME 210 Strength of Materials (Atılım University) |
| **3** | AE 417 Introduction to Finite Element Analysis (Atılım University) |
| **4** | ME 316 Machine Elements (METU) |
| **5** | ES 202 Mathematics for Engineers (METU) |
| **6** | ES 316 Computing Methods in Engineering (METU) |
| **7** | ES 525 Theory of Continuous Media 1 (METU) |

**THESES SUPERVISED**

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| --- | --- |
| 1 | MSc Thesis, Multidisciplinary investigation of c-type composite sandwich radome panels within the scope of acoustic emission based damage characterization and electromagnetic transmission performance, 2020. |
| 2 | MSc Thesis, Development of in-situ thermal monitoring system for selective laser sintering to evaluate nesting design. M.Sc. Thesis, 2020. |