Bulut Tekgül

CFD Engineer, Postdoctoral Researcher

Argonne National Laboratory, Lemont, IL, USA

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Experience

Argonne National Laboratory — *Illinois, USA*

Postdoctoral Researcher — *Jun 2021 - Present*

- Design optimization of ethanol-fueled compression ignition engines using Machine Learning and Bayesian Optimization
- Numerical analysis of active and passive pre-chamber combustion engines

Aalto University — *Espoo, Finland*

Doctoral Researcher — *Feb 2017 - May 2021*

- Leading the development process of DLBFoam, an open-source C++ based CFD solver for reactive flows
- Efficient and accurate scientific computing and engineering software development
- Investigation of the ignition characteristics of dual-fuel combustion systems
- Completed master thesis as a visiting student and part time teaching assistant

Roketsan Missiles — *Ankara, Turkey*

Mechanical Design Engineer — *Nov. 2015 - Feb. 2017*

- CAD design of a wide range of mechanical parts used in several projects
- Aerodynamic and structural analysis using FEM and CFD
- Creating technical drawings and assemby instructions for mechanical systems
- Quality control of mechanical parts produced by 3rd party suppliers

Education

Aalto University — *Espoo, Finland*

Doctor of Philosophy in Mechanical Engineering (CGPA: 3.86/5.00) — *Aug 2017 - May 2021*

- **CFD code and model development**
- **Numerical combustion**
- **Large-eddy simulation**
- **Combustion chemistry**
- **HPC applications and data analysis**

Key courses:

- Machine Learning with Python
- Programming Parallel Computers
- Numerical Matrix Computations
- Computational Fluid Dynamics

Middle East Technical University — *Ankara, Turkey*

Master of Science in Mechanical Engineering (CGPA: 3.10/4.00) — *Sep 2015 - Nov 2017*

- **Master thesis titled ”On the applicability of progress variable approach for large eddy simulation of premixed flames”**

Key courses:

- Advanced CFD
- Advanced Fluid Mechanics
- Boundary Layer Theory
- CFD for Incompressible Flows
- CFD Using Finite Volume Method

Middle East Technical University — *Ankara, Turkey*

Bachelor of Science in Mechanical Engineering (CGPA: 2.99/4.00) — *Sep 2009 - Jun 2015*

Research Efforts

Publications

- S. Karimkashi, M. Gadalla, J. Kannan, **B. Tekgül**, H. Kahila, O. Kaario and V. Vuorinen, *Large-eddy simulation of diesel pilot spray ignition in lean methane-air and methanol-air mixtures at different ambient temperatures* , Int. J. Engine Research, 2022.

- **B. Tekgül**, *Numerical studies for diesel spray assisted methane ignition at low temperature conditions*, Doctoral Thesis, 2021.

- **B. Tekgül**, P. Peltonen, H. Kahila, O. Kaario, V. Vuorinen, *DLBFoam: An open-source dynamic load balancing model for fast reacting flow simulations in OpenFOAM*, Comp. Phys. Comms., 2021.

- **B. Tekgül**, H. Kahila, O. Kaario, E. Lendormy, J. Hyvönen and V. Vuorinen, *Large-eddy simulation of spray assisted dual-fuel ignition under reactivity-controlled dynamic conditions*, Fuel, 2021.

- M. Gadalla, J. Kannan, **B. Tekgül**, S. Karimkashi, O. Kaario, and V. Vuorinen, *Large-eddy simulation of tri-fuel combustion: Diesel spray assisted ignition of methanol-hydrogen blends*, Int. J. Hydrogen Energy, 2021.

- D. Izbassarov, J. Nyari, **B. Tekgül**, E. Laurila, T. Kallio, A. Santasalo-Aarnio, O. Kaario and V. Vuorinen, *A numerical performance study of a fixed-bed reactor for methanol synthesis by CO2 hydrogenation*, Int. J. Hydrogen Energy, 2021.

- J. Kannan, M. Gadalla, **B. Tekgül**, S. Karimkashi, O. Kaario and V. Vuorinen, *Large-eddy simulation of tri-fuel ignition: diesel spray-assisted ignition of lean hydrogen–methane–air mixtures*, Comb. Theory and Modelling, 2021.

- **B. Tekgül**, H. Kahila, O. Kaario and V. Vuorinen, *Large-eddy simulation of dual-fuel spray ignition at different ambient temperatures*, Comb. and Flame, Vol. 215, 2020.

- J. Kannan, M. Gadalla, **B.Tekgül**, S. Karimkashi, O. Kaario and V. Vuorinen, *Large eddy simulation of diesel spray–assisted dual-fuel ignition: A comparative study on two n-dodecane mechanisms at different ambient temperatures*, Intl. J. Engine Research, 2020.

- M. Gadalla, J. Kannan, **B. Tekgül**, S. Karimkashi, O. Kaario and V. Vuorinen, *Large-eddy simulation of ECN Spray A: sensitivity study on modeling assumptions*, Energies, 2020.

- H. Kahila, O. Kaario, Z. Ahmad, M. Ghaderi Masouleh, **B. Tekgül**, M. Larmi and V. Vuorinen, *A large-eddy simulation study on the influence of diesel pilot spray quantity on methane-air flame initiation*, Comb. and Flame, 2019.

Ongoing work

- I. Morev, **B. Tekgül**, M. Gadalla, A. Shahanaghi, J. Kannan, S. Karimkashi, O. Kaario and V. Vuorinen, *Fast reactive flow simulations using analytical Jacobian and dynamic load balancing in OpenFOAM* (Under review, available on arXiv).

- **B. Tekgül**, S. Karimkashi, O. Kaario, H. Kahila, E. Lendormy, J. Hyvönen and V. Vuorinen, *Large-eddy simulation of split injection strategies in RCCI conditions* (Under review).

- **B. Tekgül**, I. Liu, M. Vittal, R. Schanz, J. Blumreiter, B. Johnson, G. Magnotti, *Design optimization of an ethanol direct injection engine using Design of Experiments and Bayesian Optimization* (In preperation).

Workshops & Conferences

- 10th European Combustion Meeting, Napoli, 2021 - *A load balanced chemistry model with analytical Jacobian for faster reactive simulations in OpenFOAM* (Manuscript and presentation).

- 16th OpenFOAM Workshop, Dublin, 2021 - *A dynamic load balancing model with analytical Jacobian for fast combustion simulations in OpenFOAM* (Extended abstract and presentation).

- Nordic Flame Days, Turku-Finland, 2019 - *Combustion characteristics of diesel sprays under RCCI conditions*, (Extended abstract and oral presentation).

- 17th International Conference on Numerical Combustion , Aachen-Germany, 2019 - Oral presentation on LES analysis of ambient temperature effect on diesel spray ignition in methane-air mixtures

- Finnish Flame Days, Espoo-Finland, 2018 - Oral presentation on influence of temperature on diesel spray ignition in methane-air mixtures

- Finnish OpenFOAM User Day, Espoo-Finland, 2018 - Oral presentation on premixed combustion analysis using XiFoam.

- Princeton-Combustion Institute Summer School, Princeton-USA, 2018 - Poster presentation on LES of duel-fuel spray combustion

Teaching

- AAE-E3030 - Numerical Modeling of Multiphase Flows (Lecturer and course assistant)
- EEN-E2001 - Computational Fluid Dynamics (Course assistant)
- EEN-E1020 - Heat Transfer (Course assistant)

Skills

Programming Language Python, C++, Fortran, MATLAB

Software OpenFOAM, PyTorch, GPy, GPyOpt, CONVERGE, CAESES, Cantera, Chem1D, Ember, CATIA, SolidWorks

Language English (Full professional proficiency), Turkish (Native), Finnish (Elementary proficiency)

Honors & Grants

Grants

- Merenkulun säätiö, Research grant award, 2019.

Honors

- METU High Honor List (June 2015)
- METU High Honor List (January 2015)