


CURRICULUM VITAE

Kağan Şimşek

October, 2022

Personal details

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| Contact information | Department of Physics & Astronomy Northwestern University Evanston, IL 60208 | ✉ ksimsek@u.northwestern.edu 🌐 kagsimsek.github.io 🆔 0000-0003-1741-8908 |
| Date of birth | September 1, 1991 | |
| Place of birth | Tekirdağ, Turkey | |
| Nationality | Turkish | |
| Citizenship |  | |

Education

Northwestern University, Evanston, IL, USA
Physics, Ph.D. student, Aug 2020 – Present
Advisor: Francis John Petriello
CGPA: 4.00/4.00

University of Rochester, Rochester, NY, USA
Physics, Ph.D. student, Aug 2019 – Aug 2020

Middle East Technical University, Ankara, Turkey
Physics, M.Sc., Feb 2017 – Jul 2019
Dissertation: *Exploring extra dimensions through rare processes*
Advisor: İsmail Turan
Coadvisor: İsmet Yurduşen (Hacettepe University)
CGPA: 4.00/4.00

Middle East Technical University, Ankara, Turkey
Physics, B.Sc. (double major), Sep 2012 – Feb 2017
Dissertation: *Exploring universal extra dimensions*
Advisor: İsmail Turan
CGPA: 3.70/4.00

Middle East Technical University, Ankara, Turkey
Civil engineering, B.Sc., Sep 2009 – Feb 2016
Dissertation: *Redesign of METU pedestrian bridge*
Advisor: Alp Caner
CGPA: 2.84/4.00

Employment

Northwestern University, Evanston, IL, USA
Graduate student, teaching assistant, research assistant
September 2020 – Present

University of Rochester, Rochester, NY, USA
Teaching assistant
August 2019 – August 2020

Middle East Technical University, Ankara, Turkey
Teaching assistant
October 2017 – August 2019

Middle East Technical University, Ankara, Turkey
Student assistant
October 2016 – June 2017

Asil Proje Teknik Hizmetler Mim. Müh. İnş. Tic. Ltd. Şti., Ankara, Turkey
Civil engineer
August 2015 – September 2015

Arsılanlar İnşaat Ticaret ve Turizm Ltd. Şti., Ankara, Turkey
Assistant site chief
August 2013 – September 2013

Eynehan İnşaat Taahhüt Ticaret Ltd. Şti., Ankara, Turkey
Civil engineering intern
June 2011 – September 2011

Research interest

My main field of study is theoretical particle physics. I am profoundly interested in phenomenological studies. My research area includes theories with extra dimensions, physics beyond the Standard Model, top physics, rare processes, QCD, hadron physics, and the Standard Model effective field theory.

Current research statement: My current research focuses on projections of the Standard Model effective field theory (SMEFT) using experimental data. SMEFT is a convenient extension of the Standard Model (SM) of particle physics, in which one defines additional interactions of the currently observed spectrum of the SM, without introducing new ones, in terms of coupling constants, or SMEFT variables, of unknown magnitudes. We constrain these variables using experimental data from the Large Hadron Collider (LHC) at CERN and Hadron-Electron Ring Accelerator (HERA) at DESY. We also analyze data simulated using the predicted running parameters of the Electron-Ion Collider (EIC), under consideration for construction at present. One major significance of this research lies in obtaining experimental bounds on the variables in the SMEFT using such a legacy data as of HERA. It also plays an important role in determining the goodness of future colliders in constraining SMEFT variables.

Teaching experience

During my graduate years at Northwestern University (Evanston, IL), I assisted the following courses:

- Undergraduate level

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| Physics 125-1 | General Physics ISP (2021-1) <i>Graded homework and exam papers; prepared discussion problems; delivered discussion sessions</i> |
| Physics 130-3 | College Physics (2021-3) <i>Graded quiz papers; prepared discussion problems; delivered discussion sessions</i> |
| Physics 135-2, 3 | General Physics (2021-4) <i>Graded quiz and exam papers; prepared discussion problems; delivered discussion sessions</i> |

- Graduate level

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| Physics 411-1 | Methods of Theoretical Physics (2021-1, 2022-1) <i>Graded homework papers</i> |
| Physics 412-1 | Quantum Mechanics (2022-1) |
| Physics 416-0 | Introduction to Statistical Mechanics (2021-2) <i>Graded homework papers</i> |

During my graduate year at the University of Rochester (Rochester, NY), I assisted the following courses:

- Undergraduate level

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| Phy 113, 114 | General Physics I, II (Laboratory) (2019-1, 3) <i>Graded lab report; conducted experiments; prepared lab manual</i> |
| Phy 121, 122 | Mechanics, Electromagnetism (Laboratory) (2019-1, 3) <i>Graded lab reports; conducted experiments; prepared lab manual</i> |
| Phy 142 | Electricity & Magnetism (Laboratory) (2019-1) <i>Graded lab reports; conducted experiments</i> |
| Phy 123 | Waves & Modern Physics (2019-2) <i>Graded lab reports, and homework and midterm papers; conducted experiments; delivered workshops</i> |

During my undergraduate and graduate years at Middle East Technical University (Ankara, Turkey), I assisted the following courses:

- Undergraduate level

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| Phys 105, 106 | General Physics I , II (Laboratory) (2016-1, 2; 2017-1, 2, 3; 2018-1, 2) <i>Graded lab reports and quizzes; conducted experiments</i> |
| Phys 207 | Concepts of Modern Physics (2017-1) <i>Graded quizzes</i> |
| Phys 407, 408 | Particle Physics I , II (2017-1, 2; 2018-2) <i>Graded homework papers; prepared theoretical recitation hours, quizzes, and homeworks; delivered lectures; taught bash, Mathematica, FeynArts, FormCalc, Package X, LanHEP, and CalcHEP</i> |

- Graduate level

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|---------------|---|
| Phys 507, 508 | Quantum Mechanics I , II (2017-1, 2; 2018-1, 2) <i>Graded homework and midterm papers; prepared recitation hours and homework and midterm problems; delivered lectures</i> |
| Phys 545, 546 | Particle Physics I , II (2018-1, 2) <i>Graded homework and midterm papers; prepared recitation hours and midterm problems; delivered lectures</i> |

Papers

- 9 *Neutral-current electroweak physics and SMEFT studies at the EIC*
R. Boughezal, A. Emmert, T. Kutz, S. Mantry, M. Nycz, F. Petriello, K. Şimşek, D. Wiegand, X. Zheng
[Phys. Rev. D **106** \(2022\) 016006](#)
[arXiv: 2204.07557](#)
- 8 *Snowmass 2021 White Paper: Electron Ion Collider for high energy physics*
R. Abdul Khalek *et al.*
[arXiv: 2203.13199](#)
- 7 *Strong coupling constants of charmed and bottom mesons with light vector mesons in QCD sum rules*
T. M. Aliev, K. Şimşek
[Phys. Rev. D **104** \(2021\) 074034](#)
[arXiv: 2107.02735](#)
- 6 *Strong $B_{QQ'}^* B_{QQ'} V$ vertices and the radiative decays of $B_{QQ}^* \rightarrow B_{QQ} \gamma$ in the light-cone sum rules*
T. M. Aliev, T. Barakat, K. Şimşek
[Eur. Phys. J. A **57** \(2021\) 160](#)
[arXiv: 2101.10264](#)
- 5 *Strong vertices of doubly heavy spin-3/2 baryon to spin-1/2 baryon with light mesons in light-cone QCD sum rules*
T. M. Aliev, K. Şimşek
[Phys. Rev. D **103** \(2021\) 054044](#)
[arXiv: 2011.07150](#)
- 4 *Gravitational form-factors of the ρ , π , and K mesons in QCD sum rules*
T. M. Aliev, T. Barakat, K. Şimşek
[Phys. Rev. D **103** \(2021\) 054001](#)
[arXiv: 2008.04385, 2009.07926](#)
- 3 *Strong coupling constants of doubly heavy baryons with vector mesons in QCD*
T. M. Aliev, K. Şimşek
[Eur. Phys. J. C **80** \(2020\) 976](#)
[arXiv: 2009.03464](#)
- 2 *Determination of the strong vertices of doubly heavy baryons with pseudoscalar mesons in QCD*
H. I. Alrebdi, T. M. Aliev, K. Şimşek
[Phys. Rev. D **102** \(2020\) 074007](#)
[arXiv: 2008.05098](#)

- 1 $N^*(1535) \rightarrow N$ transition form-factors due to the axial current
T. M. Aliev, T. Barakat, K. Şimşek
Phys. Rev. D **100** (2019) 054030
[arXiv: 1907.08017](#)

Seminars & Talks

- 6 **SMEFT projections of neutral-current PVDIS asymmetries at the EIC**
EIC Early Career Workshop 2022
CFNS Stony Brook University and remote
Talk (invited)
July 25, 2022
- 5 **SMEFT projections using EIC PVDIS asymmetries**
INT Workshop: Parity-Violation and other Electroweak Physics at JLab 12 GeV and Beyond
Remote
Talk (invited)
June 27, 2022
- 4 **Neutral-current SMEFT studies at the EIC**
CFNS Workshop: High-Luminosity EIC (EIC Phase II)
Remote
Talk (invited)
June 21, 2022
- 3 **Neutral-Current SMEFT Studies at the EIC**
HEP Seminars
Northwestern University
Seminar
April 18, 2022
- 2 **Applications of MUED to Rare Top Quark Processes**
2020 GSRM Talks
University of Rochester
Talk
February 8, 2020
- 1 **Universal Extra Dimensions**
Middle East Technical University
Seminar
December 6, 2018

Organizations attended

- 4 EIC User Group Early Career Workshop 2022, CFNS Stony Brook University NY and online, July 24-25, 2022.
- 3 2022 CTEQ Summer School on QCD and Electroweak Phenomenology, the University of Pittsburgh PA, July 6-16, 2022.
- 2 INT Workshop: Parity-Violation and other Electroweak Physics at JLab 12 GeV and Beyond, online, June 27-July 1, 2022.
- 1 CFNS Workshop: High-Luminosity EIC (EIC Phase II), online, June 21-24, 2022.

Awards

[Northwestern University, Evanston, IL, USA](#)
Scholarship covering full tuition and monthly stipend
Aug 2020 – Present

[University of Rochester, Rochester, NY, USA](#)
Scholarship covering full tuition and monthly stipend
Aug 2019 – Jun 2020

Computer skills

My main tool for computations is MATHEMATICA. I am experienced in HEP packages such as FEYNARTS, FORMCALC, LOOP-TOOLS, FEYNCALC, PACKAGE X, LANHEP, CALCHEP, and LHAPDF, and proficient in \TeX , Bash, Python, and Fortran.

Hobbies

I play the piano, guitar, and pretty much anything that I can get my hands on. I occasionally enjoy composing and producing. I am also a licensed player of the Turkish Chess Federation. In addition to physics and music, computers are my passion. I find delight in developing scripts for physics and other daily activities.

References

In the alphabetical order of last names:

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| Takhmasib M. Aliev Professor | Department of Physics Middle East Technical University 06800, Ankara, Turkey | ☎ +90.312.210.5046 ✉ taliev@metu.edu.tr |
| Francis John Petriello Professor | Department of Physics & Astronomy Northwestern University 60208, Evanston, IL, USA | ☎ +1.847.467.3196 ✉ f-petriello@northwestern.edu 🌐 gate.hep.anl.gov/fpetriello/index.html |
| B. Özgür Sarioğlu Professor | Department of Physics Middle East Technical University 06800, Ankara, Turkey | ☎ +90.312.210.4337 ✉ sarioglu@metu.edu.tr 🌐 metu.edu.tr/~sarioglu |
| Hande Toffoli Associate Professor Chair Advisor | Department of Physics Middle East Technical University 06800, Ankara, Turkey | ☎ +90.312.210.3264 ✉ ustunel@metu.edu.tr 🌐 physics.metu.edu.tr/~hande |
| İsmail Turan Professor Vice Chair | Department of Physics Middle East Technical University 06800, Ankara, Turkey | ☎ +90.312.210.5083 ✉ ituran@metu.edu.tr 🌐 metu.edu.tr/~ituran |