CURRICULUM VITAE

Kağan Şimşek

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Personal details

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
Grad student (4 q.), TA (2 q.), RA (1 q.)
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

Arslanlar 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 phenomenological particle physics. 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

Physics 125-1	General Physics ISP (2021-1) *Graded homework and exam papers; prepared discussion problems; conducted discussion sessions*
Physics 130-3	College Physics (2021-3) *Graded quiz papers; prepared discussion problems; conducted discussion sessions*

- Graduate level

Physics 411-1	Methods of Theoretical Physics (2021-1) *Graded homework papers*
Physics 416-0	Introduction to Statistical Mechanics (2021-2) *Graded homework papers*

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

- Undergraduate level

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

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

- Undergraduate level

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

- Graduate level

Phys 507 - 508	Quantum Mechanics I - II (2017-1, 2; 2018-1, 2) *Graded homework and midterm papers; prepared recitation hours and homework and midterm problems; conducted lectures*
Phys 545 - 546	Particle Physics I - II (2018-1, 2) *Graded homework and midterm papers; prepared recitation hours and midterm problems; conducted lectures*

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
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 $B^*_{QQ} \to B_{QQ}\gamma$ 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 *$N^*(1535) \to N$ 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

5 **INT Workshop: Parity-Violation and other Electroweak Physics at JLab 12 GeV and Beyond**
Online
Seminar (invited)
June 27, 2022

4 **CFNS Workshop: High-Luminosity EIC (EIC Phase II)**
Online
Seminar (invited)
June 21, 2022

3 **Neutral-Current SMEFT Studies at the EIC**
Northwestern University
HEP Seminar
April 18, 2022

2 **Applications of MUED to Rare Top Quark Processes**
University of Rochester
2020 GSRM Talks
February 8, 2020

1 **Universal Extra Dimensions**
Middle East Technical University
Seminar
December 6, 2018

Organizations attended

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.

Computer skills

My main tool for computations is MATHEMATICA. I am experienced in HEP packages such as FEYNARTS, FORMCALC, LOOPTOOLS, 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:

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 Sarıoğlu
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
Chairperson 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 Chairperson

Department of Physics
Middle East Technical University
06800, Ankara, Turkey

+90.312.210.5083
ituran@metu.edu.tr
metu.edu.tr/~ituran