


# CURRICULUM VITAE

Kağan Şimşek

December, 2022

## Personal details

---

Contact information	Department of Physics & Astronomy Northwestern University Evanston, IL 60208	✉ <a href="mailto:ksimsek@u.northwestern.edu">ksimsek@u.northwestern.edu</a> 🌐 <a href="https://github.com/kagsimsek">kagsimsek.github.io</a> 🆔 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. candidate, 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

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

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

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

Phys 105, 106	General Physics <a href="#">I</a> , <a href="#">II</a> (Laboratory) (2016-1, 2; 2017-1, 2, 3; 2018-1, 2) <i>Graded lab reports and quizzes; conducted experiments</i>
Phys 207	<a href="#">Concepts of Modern Physics</a> (2017-1) <i>Graded quizzes</i>
Phys 407, 408	Particle Physics <a href="#">I</a> , <a href="#">II</a> (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

Phys 507, 508	Quantum Mechanics <a href="#">I</a> , <a href="#">II</a> (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 <a href="#">I</a> , <a href="#">II</a> (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  $\rho$ ,  $\pi$ , 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

---

- 7 SMEFT projections at the EIC and LHeC to NLO QCD  
*Candidacy talk*  
Northwestern University  
Talk  
December 2, 2022
- 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, FEYNALC, PACKAGE X, LANHEP, CALCHEP, and LHAPDF, and proficient in  $\text{\TeX}$ , 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:*

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