


# CURRICULUM VITAE

Kağan Şimşek

June, 2022

## Personal details

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Date of birth	September 1, 1991	
Place of birth	Tekirdağ, Turkey	
Nationality	Turkish	
Citizenship		

## Education

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**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

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**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

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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

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

- Undergraduate level

Physics 125-1	<a href="#">General Physics ISP</a> (2021-1) <i>Graded homework and exam papers; prepared discussion problems; conducted discussion sessions</i>
Physics 130-3	<a href="#">College Physics</a> (2021-3) <i>Graded quiz papers; prepared discussion problems; conducted discussion sessions</i>

- Graduate level

Physics 411-1	<a href="#">Methods of Theoretical Physics</a> (2021-1) <i>Graded homework papers</i>
Physics 416-0	<a href="#">Introduction to Statistical Mechanics</a> (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	<a href="#">General Physics I - II</a> (Laboratory) (2019-1, 3) <i>Graded lab report; conducted experiments; prepared lab manual</i>
Phy 121 - 122	<a href="#">Mechanics - Electromagnetism</a> (Laboratory) (2019-1, 3) <i>Graded lab reports; conducted experiments; prepared lab manual</i>
Phy 142	<a href="#">Electricity &amp; Magnetism</a> (Laboratory) (2019-1) <i>Graded lab reports; conducted experiments</i>
Phy 123	<a href="#">Waves &amp; Modern Physics</a> (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 <b>I - II</b> (Laboratory) (2016-1, 2; 2017-1, 2, 3; 2018-1, 2) <i>Graded lab reports and quizzes; conducted experiments</i>
Phys 207	<b>Concepts of Modern Physics</b> (2017-1) <i>Graded quizzes</i>
Phys 407 - 408	Particle Physics <b>I - II</b> (2017-1, 2; 2018-2) <i>Graded homework papers; prepared theoretical recitation hours, quizzes, and homeworks; conducted lectures; taught bash, Mathematica, FeynArts, FormCalc, Package X, LanHEP, and CalcHEP</i>

- Graduate level

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

## Papers

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- 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  $B_{QQ}^* \rightarrow B_{QQ} \gamma$  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

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### 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

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- 1 CFNS Workshop: High-Luminosity EIC (EIC Phase II), online, June 21-24, 2022.

## Computer skills

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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  $\text{\LaTeX}$ , Bash, Python, and Fortran.

## Hobbies

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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

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*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 Chairperson 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 Chairperson	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>