

# Onur Varol

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Faculty of Engineering and Natural Sciences  
Sabanci University, Istanbul Türkiye

## RESEARCH INTERESTS

My research focuses on developing techniques to analyze **online behaviors** to improve **individual well-being** and address **societal problems** using online data. I leverage online and offline data to gain insight on human behaviors, analyze technological systems to mitigate threats against online conversations by developing techniques in **machine learning**, **network science**, and computational social sciences.

## HONORS & AWARDS

2022 – METU Parlar Foundation, [Research Incentive Award](#)  
2022 – The Turkish Science Academy BAGEP, [Young Scientist Award](#)  
2019 – Invited to attend 7<sup>th</sup> Heidelberg Laurites Forum, Heidelberg Germany  
2018 – University Distinguished Ph.D. Dissertation Award for Indiana University

## EMPLOYMENT

### **Sabanci University**, Istanbul Türkiye

- Assistant Professor, Faculty of Engineering and Natural Sciences, Computer Science and Engineering (2021/01 – )
- Faculty Member, Center of Excellence in Data Analytics (2021/01 – )

### **Northeastern University**, Boston, MA USA

- Postdoctoral Researcher, Center for Complex Network Research (2017/07 – 2020/07)
- NSF I-Corps Site Fellow, Center for Entrepreneurship Education (2019/01 – 2019/05)

## EDUCATION

### **Indiana University**, Bloomington, IN USA

**2017/06 – PhD in Informatics**, Complex Systems Track and Minor in Statistics

Dissertation: Analyzing Social Big Data to Study Online Discourse and its Manipulation

(Awarded for University Distinguished Ph.D. Dissertation Award)

Committee: Filippo Menczer, Alessandro Flammini, Yong-Yeol Ahn, Christine Ogan, Weihua An

### **Koc University**, Istanbul, Türkiye

**2012/07 – MSc in Computer Science and Engineering**

Thesis: Modal analysis of Myosin II and Identification of Functionally Important Sites

### **Istanbul Technical University**, Istanbul, Türkiye

**2012/06 – BSc in Physics Engineering**

**2010/06 – BSc in Electronics Engineering**

## WORK EXPERIENCE

**Data Science Consultant.** I worked on various data science projects to support business intelligence, predictive analytics, and knowledge discovery by building machine learning pipelines, developing web platforms, and providing descriptive analysis and KPI reports. I was also an NSF I-Corps Site Fellow of the program organized by Center for Entrepreneurship Education at Northeastern University to receive training on transferring lab-based research to industry.

## Microsoft Research, Redmond WA USA

- Research Intern (2015/06 – 2015/09): I worked in the CLUES group at MSR. I studied social media timelines of individuals to detect experiential activities and analyzed outcomes of those actions. This project involved analyzing search query logs and social media timelines.
- Research Intern (2014/06 – 2014/09): I worked in the CLUES group at MSR. I studied how individuals in social networks adopt their behaviors to match with their inner intents. I carried out experiments on Amazon Mechanical Turk platform to justify our hypothesis at the micro level and analyzed Twitter data to validate effects at the macro level.

## Stonefish Software and Consultancy, Istanbul Türkiye

Software Developer (2009/08 – 2010/03): I worked on an enterprise web application development using C#, ASP.NET, and MSSQL.

## GRANTS & FUNDING

### Active Research Grants

- PI, EU CHIST-ERA, “CON-NET: Integrating CONtent and NETwork structure for detecting, understanding, and mitigating online misbehaviour” (2023 – 2026, *Sabancı portion 82.000 €*)
- PI, TÜBİTAK 2247D, “Developing systems for coordination and automated behavior detection on online social networks” (2022 – 2025, *100.000 € and tuition support for 2 postdoctoral researchers and 3 PhD students*)
- PI, Sabanci University President's Office Fund, “Observatory of Online Conversations and Belief Modeling” (2022 – 2025, *20.000 €*)
- Advisor, TÜBİTAK 3501, “Network Analysis of Global Diplomatic Interactions through Bureaucrats, Time, and Space” (2024 – 2025, *30.000 €*)

### Completed Research Grants

- PI, TÜBİTAK 1002, “Causal analysis of daylight-saving time and quantifying its impact on wellbeing” (2021 – 2022, *4.500 €*)
- PI, Sabanci University Integration Grant, “Collecting Social Media Data Streams and Experimentation of Online Networks” (2021 – 2023, *10.000 €*)

## PUBLICATIONS

Google Scholar

[\(t8YAefAAAAAJ\)](#)  
Citations: 11400+  
h-index: 29  
i10-index: 34

ORCID

[\(0000-0002-3994-6106\)](#)

### Peer-reviewed Journal Articles

- J.27 A. Najafi, O. Varol. "Turkishbertweet: Fast and reliable large language model for social media analysis." *Expert Systems with Applications*, 2024
- J.26 X. Meng, O. Varol, A.L. Barabasi. "Hidden citations obscure true impact in science." *PNAS Nexus*, 2024
- J.25 A. Najafi, N. Mugurtay, Y. Zouzou, E. Demirci, S. Demirkiran, H.A. Karadeniz, O. Varol. "First public dataset to study 2023 Turkish general election." *Scientific Reports* 14(1), 2024
- J.24 O. C. Seckin, A. Atalay, E. Otenen, U. Duygu, O. Varol “Mechanisms Driving Online Vaccine Debate During the COVID-19 Pandemic”, *Social Media + Society*, 10(1)., 2024
- J.23 O. Varol “Should we agree to disagree about Twitter's bot problem?”, *Online Social Networks and Media*, 37 (2023): 100263.
- J.22 O.C. Seckin, O. Varol “Academic Support Network Reflects Doctoral Experience and Productivity”, *EPJ Data Sci.* 11, 57, 2022

- J.21 O. Bas, C. Ogan, O. Varol “The Role of Legacy Media and Social Media in Increasing Public Engagement About Violence Against Women in Turkey”, *Social Media+ Society* 8, 4, 2022
- J.20 Wang, X., Varol, O., Eliassi-Rad, T. “Information Access Equality on Network Generative Models” *Applied Network Science* 7, 54, 2022
- J.19 Singh, K., Lima, G., Cha, M., Cha, C., Kulshrestha, J., Ahn, Y. Y., Varol, O. “Misinformation, Believability, and Vaccine Acceptance Over 40 Countries: Takeaways From the Initial Phase of The COVID-19 Infodemic” *Plos One*, 17(2), e0263381, 2022
- J.18 Gysi D., Do Valle I., Zitnik M., Ameli A., Gan X., Varol O., Sanchez H., Baron R., Ghiassian D., Loscalzo J., Barabasi AL. “Network Medicine Framework for Identifying Drug Repurposing Opportunities for COVID-19” *Proceedings of the National Academy of Sciences*, 118 (19) e2025581118, 2021
- J.17 Cha, M., Cha, C., Singh, K., Lima, G., Ahn, Y. Y., Kulshrestha, J., Varol, O. “COVID-19 Infodemic Prevalence over 35 Countries”. *JMIR Human Factors*, 2020
- J.16 Pasquetto, I, Swire-Thompson, B., Amazeen, M., Benevenuto, F., Brashier, N.M., Bond, R.M., Bozarth, L.C., Budak, C., Ecker, U.KH., Fazio, L.K., Ferrara, E., Flanagan, A.J., Flammini, A., Freelon, D., Grinberg, N., Hertwig, R., Jamieson, K.H., Joseph, K., Jones, J.J., Garrett, R.K., Kreiss, D., McGregor, S., McNealy, J., Margolin, D., Marwick, A., Menczer, F., Metzger, M.J., Nah, S., Lewandowsky, S., Lorenz-Spreen, P., Ortellado, P., Pennycook, G., Porter, E., Rand, D.G., Robertson, R., Tripodi, F., Vosoughi, S., Vargo, C., Varol, O., Weeks, B.E., Wihbey, J., Wood, T.J., Yang, K.C. “Tackling misinformation: What researchers could do with social media data” *Harvard Kennedy School (HKS) Misinformation Review*, 1(8)., 2020
- J.15 Fragile Families Challenge Team “Measuring the predictability of life outcomes with a scientific mass collaboration” *Proceedings of the National Academy of Sciences*, 117.15: 8398-8403, 2020
- J.14 Gates AJ., Ke Q., Varol O., Barabasi AL. “Nature's reach: narrow work has broad impact”, *Nature* (2019): 32-34.
- J.13 O. Varol, I. Uluturk “Journalists on Twitter: Self-branding, Audiences, and Involvement of Bots” *Journal of Computational Social Science*, 1-19, 2019
- J.12 X. Wang, B. Yucesoy, O. Varol, T. Eliassi-Rad, AL. Barabási “Success in Books: Predicting Book Sales Before Publication” *EPJ Data Science* 8.1: 31, 2019
- J.11 Yang K., Varol O., Davis C., Ferrara E., Flammini A., Menczer F. “Arming the public with AI to counter social bots” *Human Behavior and Emerging Technologies*, 1(1), 48-61, 2019
- J.10 R. Fan, O. Varol, A. Varamesh, A. Barron, I. Leemput, M. Scheffer, J. Bollen “The minute-scale dynamics of online emotions reveal the effects of affect labeling”, *Nature Human Behavior*, 3.1: 92, 2019
- J.9 C. Shao, GL Ciampaglia, O. Varol, K. Yang, A. Flammini, F. Menczer “The spread of low-credibility content by social bots”, *Nature Communications* 9:4787, 2018
- J.8 O. Varol, I. Uluturk, “Deception Strategies and Threats for Online Discussions” *First Monday* 22(5), 2018
- J.7 O Varol, E Ferrara, F Menczer, A Flammini. “Early Detection of Promoted Campaigns on Social Media”. *EPJ Data Science* 6(13), 2017

- J.6 C. Ogan, O. Varol “What is gained and what is left to be done when content analysis is added to network analysis in the study of a social movement: Twitter use during Gezi Park”, *Information, Communication and Society* 20(8):1220-1238, 2017
- J.5 E Ferrara, O Varol, C Davis, F Menczer, A Flammini “The Rise of Social Bots”, *Communications of the ACM* 59(7):96-104, 2016
- J.4 Davis CA, Ciampaglia GL, Aiello LM, Chung K, Conover MD, Ferrara E, Flammini A, Fox GC, Gao X, Gonçalves B, Grabowicz PA, Hong K, Hui P, McCauley S, McKelvey K, Meiss MR, Patil S, Peli Kankanamalage C, Pentchev V, Qiu J, Ratkiewicz J, Rudnick A, Serrette B, Shiralkar P, Varol O, Weng L, Wu T, Younge AJ, Menczer F. “OSoMe: The IUNI observatory on social media”, *PeerJ Computer Science* 2: e87, 2016
- J.3 V.S. Subrahmanian, A. Azaria, S. Durst, V. Kagan, A. Galstyan, K. Lerman, L. Zhu, E. Ferrara, A. Flammini, F. Menczer, R. Waltzman, A. Stevens, A. Dekhtyar, S. Gao, T. Hogg, F. Kooti, Y. Liu, O. Varol, P. Shiralkar, V. Vydiswaran, Q. Mei, T. Huang. “The DARPA Twitter Bot Challenge”, *IEEE Computer* 49(6), 2016
- J.2 M JafariAsbagh, E Ferrara, O Varol, F Menczer, A Flammini “Clustering memes in social media streams”, *Social Network Analysis and Mining* 4(237):1-13, 2014
- J.1 O. Varol, D. Yuret, B. Erman, A. Kabakcioglu “Mode coupling points to functionally important residues in Myosin II”, *Proteins: Structure, Function, and Bioinformatics* 82(9):1777--86, 2014

#### **Referred Conference Proceedings**

- C.20 O. Yargi, O. Varol. "Instagram Account Classification: Influencer vs. Company Profiles." Signal Processing and Communications Applications Conference, 2024 (Turkish)
- C.19 A.O. Yener, A. Najafi, O. Varol. "City-level User Location Detection from Social Media and Analysis of Political Participation." Signal Processing and Communications Applications Conference, 2024.
- C.18 A. Najafi, O. Varol. "VRLLab at HSD-2Lang 2024: Turkish hate speech detection online with TurkishBERTweet." Proceedings of the 7th Workshop on Challenges and Applications of Automated Extraction of Socio-political Events from Text (CASE 2024). 2024.
- C.17 O. Varol “Who Follows Turkish Presidential Candidates in 2023 Elections?”, Signal Processing and Communications Applications Conference, 2023 (Turkish)
- C.16 J. Pfeffer, D. Matter, K. Jaidka, O. Varol, A. Mashhadi, J. Lasser, D. Assenmacher, S. Wu, D. Yang, C. Brantner, D. M. Romero, J. Otterbacher, C. Schwemmer, K. Joseph, D. Garcia, F. Morstatter “Just Another Day on Twitter: A Complete 24 Hours of Twitter Data”, ICWSM'23
- C.15 M. Sayyadiharikandeh, O. Varol, K. Yang, A. Flammini, F. Menczer “Detection of Novel Social Bots by Ensembles of Specialized Classifiers”, CIKM'20
- C.14 Yang K., Varol O., Hui P., Menczer F. “Scalable and Generalizable Social Bot Detection through Data Selection”, AAAI'20
- C.13 Varol O., Davis C., Ferrara E., Menczer F., Flammini A. “Online Human-Bot Interactions: Detection, Estimation, and Characterization”, ICWSM'17

- C.12 Olteanu, A., Varol, O., Kiciman, E. “What Does Social Media Say about the Outcomes of Personal Experiences”, CSCW'17
- C.11 Ferrara E., Wang W., Varol O., Flammini A., Galstyan A. “Predicting online extremism, content adopters, and interaction reciprocity”, SocInfo'16
- C.10 O Varol, “Spatiotemporal Analysis of Censored Content on Twitter”. WebScience'16
- C.9 A Das, S Gollapudi, E Kiciman, O Varol, “Information Dissemination in Heterogeneous-Intent Networks”. WebScience'16
- C.8 E. Ferrara, O Varol, F Menczer, and A Flammini. “Detection of Promoted Social Media Campaigns”. ICWSM'16
- C.7 A Olteanu, O Varol, E Kiciman. “Towards an Open-Domain Framework for Distilling the Outcomes of Personal Experiences from Social Media Timelines”. ICWSM'16
- C.6 C Davis, O Varol, E Ferrara, A Flammini, F Menczer “BotOrNot: A System to Evaluate Social Bots”. WWW'16 Developers Day
- C.5 O Varol, E Ferrara, C Ogan, F Menczer, and A Flammini. “Evolution of online user behavior during a social upheaval”. WebScience'14 (*Best paper award*)
- C.4 O Varol and F Menczer. “Connecting Dream Networks Across Cultures”. WWW 2014 workshop on Connecting Online & Offline Life
- C.3 Ferrara, E., Varol, O., Menczer, F. & Flammini, A. “Traveling Trends: Social Butterflies or Frequent Fliers?”, ACM Conf. on Online Social Networks 2013
- C.2 E Ferrara, M JafariAsbagh, O Varol, V Qazvinian, F Menczer, A Flammini “Clustering Memes in Social Media”, ASONAM 2013
- C.1 Y Alban, T Ayhan; O Varol, ME Yalcin “A Feature Filtering Method for EEG Data Classification”, Signal Processing and Communications Applications Conference, 2011. (Turkish)

#### **Book chapters**

- B.2 Yang K. C., Varol O., Nwala A. C., Sayyadiharikandeh, M., Ferrara, E., Flammini, A., Menczer, F. “Social Bots: Detection and Challenges”, Handbook of Computational Social Science (2024)
- B.1 Varol O., Davis C., Menczer, F., Flammini, A. “Feature Engineering for Social Bot Detection”, Feature Engineering for Machine Learning and Data Analytics (2018): 311.

#### **Patent Applications**

- P.2 “Network Medicine Framework for Identifying Drug Repurposing Opportunities” Deisy Morselli Gysi, Albert-László Barabási, Italo Faria Do Valle, Onur Varol, Xiao Gan, Asher Ameli, Joseph Loscalzo, Marinka Zitnik (2022). U.S. Patent Application No. 17/456,519.
- P.1 “Peak sale and one year sale prediction for hardcover first releases” Yucesoy, B., Wang, X., Barabasi, A. L., Varol, O., Ruppert, P., Eliassi-Rad, T. (2019). U.S. Patent Application No. 16/012,181.

#### **TEACHING**

##### **Sabanci University, Istanbul Türkiye**

- Machine Learning (Lecturer, SP22, FA23, FA24)
- Introduction to Data Science (Lecturer, SP23, FA24)
- Network Science (Lecturer, Spring semesters 2021-2024)

## **Northeastern University, Boston, MA USA**

- Algorithms that Affect Lives (Guest Lecturer, FA21, FA20)
- Unsupervised Machine Learning and Data Mining (Guest Lecturer, FA19)
- Data Mining Techniques (Guest Lecturer, SP19, FA18)

## **ADVISING & MENTORING**

### **Sabanci University, Istanbul Türkiye**

*Current members of the VRL Lab available on our website ([varollab.com/people.html](http://varollab.com/people.html))*

- Nihat Mugurtay (Postdoctoral researcher, [SP22, – ])
- Yasemin Tosun (Postdoctoral researcher, [FA23, – ])
- Vahid Khalili (Computer Science PhD student, [SP22, – ])
- Ozgun Yargi (Computer Science PhD student, [SP23, – ])
- Ali Najafi (Computer Science PhD student, [SP24, – ])
- Serhat Demirkiran (Data Science MSc student, [SP22, – ])
- Hasan Kemik (Computer Science MSc student, [SP22, – ])
- Aysegul Rana Erdemli (Computer Science MSc student, [SP22, – ])

### **VRL Lab. Alumni**

- Ali Najafi (Computer Science MSc student, [SP22, SP24])
- Yasser Zouzou (Data Science MSc student, [SP22, SP24])
- Umut Duygu (Political Science MA student, [SP21, SP23])
- Furkan Okuyucu (Data Science MSc student, [SP21, SP23])
- Mutlu Soruklu (Data Science MSc student, [SP21, SP23])
- Ozgun Yargi (Data Science MSc student, [SP21, FA23])
- Baris Temel (Data Science MSc student, [SP21, FA23])
- Davut Bayik (Data Science MSc student, [SP21, SP22])
- Mert Ozturk (Data Science MSc student, [SP21, SP22])
- Ozgur Can Seekin (Data Science MSc student, [SP21, SP22])

## **PROFESSIONAL ACTIVITIES**

### **Editorial Boards**

- Associate Editor, EPJ-DS (2023 – )
- Area Editor, PloS One (2022 – 2024)
- Area Editor, Online Social Networks and Media (2021 – )

### **Grant panels and reviewer**

Scientific and Technological Research Council of Türkiye (TUBITAK), ERC Starting Grant (2020), ERC Consolidator Grant (2024), Singapore A\*STAR (2024), Bar Ilan Cyber Security Center (2019)

### **Journal Reviewer**

PNAS; PNAS Nexus; Nature Human Behavior; Nature Communications; Nature Machine Intelligence; Communications of the ACM; EPJ Data Science; PLoS One; Network Science; npj Complexity; Social Networks; Nature Scientific Reports; Social Network Analysis and Mining; Communications Physics; Journal of Computational Social Sciences; Information, Communication and Society; PeerJ-CS; ACM Transactions on Social Computing; ACM Transactions on the Web; IEEE Transactions on Knowledge and Data Engineering; IEEE Access; IEEE Intelligent Systems; IEEE Communications Magazine; Big Data; First Monday; Journal of Medical Internet Research; Journal of the Royal Society Interface; Patterns; Computers in Human

Behavior; Data Mining and Knowledge Discovery; Information; Online Information Review; Social Science Research; Social Science Computer Review; Online Social Networks and Media; Applied Network Science; International Journal of Information Management; International Journal of Public Opinion Research

### **Organized Scientific Events**

- Program co-chair, “Complex Networks” (2024)
- Co-organizer, “Science Academy Machine Learning Summer School” (2023)
- Identifying Networks of Social Bots on Twitter Conversations, Summer Institute of Computational Social Science (SICSS 2020)
- Workshop on “Misinformation and Social Bots” at the 7th Heidelberg Laureate Forum (2019/09)
- Publication Chair, IC2S2 2020
- Satellite co-organizer, “Quantifying Success” (Networks 2020, NetSci 2020)

### **Conference Senior Program Committee Member**

HyperText'18; ICWSM'20-'24

### **Conference Program Committee Member**

WEB'17-'21; WSDM'19-'21; ICWSM'17-'20; KDD'19; SDM'19; AAAI'21; WebSci'18/'19/'20; CHI'18; CSCW'18/'19; CompleNet'18-'22; NetSci'17-'20; NetSciX'20; SocInfo'17-'20; IC2S2'17-'21; ICCS'20; HyperText'17-'19; DSAA'17-'19

### **Invited Talks**

- Analyzing User and Group Behavior during Elections: Coordination, Bots and Misinformation
  - Luxembourg Institute of Science and Technology (Online, 2023/12/12)
  - The Institute for Analytical Sociology Sweden (2023/10/12)
- Panelist for “21. Yüzyılda Gelişen Teknoloji, Değişen Toplum ve Siyaset”, The Science Academy (2023/11/17)
- Panelist for “Fact Checking, Fake News and Bot Detection” session, Global Politics in the Age of Computational Propaganda Online Conference (Online, 2021/05/06)
- Modeling individual and group behavior in complex interactive systems
  - GESIS (Online, 2021/01/19)
  - Center for Research on Globalization, Peace and Democratic Governance (Online, 2021/01/05)
  - The University of Edinburgh, Scotland (Online, 2020/03/30)
  - Aalto University, Finland (Online, 2020/03/16)
  - Vanderbilt University, USA (2020/02/12)
  - Bilkent University, Turkey (2019/10/08)
  - Sabanci University, Turkey (2019/10/03)
  - Kadir Has University, Turkey (2019/10/02)
  - Koc University, Turkey (2019/10/01)
  - University of Pittsburgh School of Computing and Information (2019/04/17)
- Detecting Social Bots and Modeling Online Behavior, Microsoft Research AI Breakthroughs, Redmond, USA (2018/09/17)



- Observatory of Social Media, Exploring Media Ecosystems Conference at MIT Media Lab (2017/03/06)
- Predicting adolescence academic performance through panel survey data, Fragile Families Challenge Scientific Workshop at Princeton University (2017/11/17)
- Observatory on Social Media: Investigating Bots and Disinformation, Digital Disinformation Forum Stanford (2017/06/26)
- The Impact of Censorship on Tweeting Behaviors, Indiana University Conference on Big Data and Network Science (2017/03/23)
- Studying Individuals and Groups using Online Data, Northeastern University Network Science Institute (2017/03/09)
- Analysis of Online Discourse and Information Diffusion, INFORMS Meeting Nashville (2016/11/15)
- Detection of Online Manipulation, UND Big Data Summit Event (2016/04/07)
- Twitter Applications: Industry Panel Speaker, UND Big Data Summit Event (2016/04/07)
- Campaign and Social Bots Detection on Social Networks, Workshop in Network Science (WINS) Indiana University (2016/02/18)
- Evolution of online user behavior during a social upheaval, Indiana University Turkish Flagship Center (2015/01/21)
- Studying Social Dynamics Through Social Media, Istanbul Technical University Physics Department Colloquia (2014/04/28)

#### **Conference Presentations**

- Academic Support Network Reflects Doctoral Experience and Productivity, International Conference on Computational Social Science, Copenhagen, Denmark (2023-07-19)
- Academic Support Network Reflects Doctoral Experience and Productivity, Complex Network Conference, Palermo, Italy (2022-11-09)
- Journalists on Twitter: Self-branding, Audiences, and Involvement of Bots, Politics and Computational Social Science, Washington, DC. USA (2019-08-28)
- Detection, Estimation, and Characterization of Bot Nodes in Social Networks, Network Science Conference, Indianapolis USA (2017-06-21)
- Distilling the Outcomes of Personal Experiences from Social Media Timelines, International Conference on Computational Social Science, Evanston Illinois USA (2016-06-25)
- Information Dissemination in Heterogeneous-Intent Networks, Web Science Conference, Hannover Germany (2016-05-24)
- Evolution of Online User Behavior During Social Upheaval, Conference on Complex Systems (CCS), Tempe Arizona USA (2015-09-27)
- Connecting Dream Networks Across Cultures, COOL Workshop at World Wide Web (WWW) Conference, Seoul Korea (2014-04-08)

#### **Turkish Outreach**

- Gelişen teknoloji, değişen toplum: Sosyal medya, devletler ve toplum ilişkisi, sosyal botlar ve dezenformasyon, Açık Radyo (2024/01/19)  
<https://acikradyo.com.tr/podcast/242662>



- Seçim manipölasyonları tespit edilebilir mi?, MedyaScope (2022-10-20) [youtube.com/watch?v=130mHP5\\_ZTc](https://youtube.com/watch?v=130mHP5_ZTc)
- Zararlı Sosyal Medya Kampanyaları, Twitter Botları ve Sosyal Riskleri Önleme Algoritmaları? (2020-10-23) [breaker.audio/veri-tezgahi/e/76727081](https://breaker.audio/veri-tezgahi/e/76727081)
- Hesaplamalı Sosyal Bilimler, Data Science Summer School at Sabanci University (2020-09-24) [youtube.com/watch?v=H7iPfHNHyo4](https://youtube.com/watch?v=H7iPfHNHyo4)
- Sosyal Medyanın Problemleri, epiSTEM Türkiye Youtube Live (2020-05-03) [youtube.com/watch?v=Mzjf7r6F5mQ](https://youtube.com/watch?v=Mzjf7r6F5mQ)

## REFERENCES

Available upon request.