

Abdelhak Bentaleb

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[Google Scholar] [Research Gate] [Linkedin]

RESEARCH INTERESTS

Computing systems, Networked multimedia and systems, Computer systems and networks, Video streaming architecture and content delivery, Multimedia systems and streaming, Immersive media technologies, Edge and distributed computing, Wireless communication and mobile networking, Machine, and deep learning systems, IoT systems.

EDUCATION

National University of Singapore

Singapore

Ph.D. in Computer Science

January 2015–2019

- Dissertation: Enabling Optimizations of Video Delivery in HTTP Adaptive Streaming
- Winner of SIGMM Award for Outstanding PhD Thesis and DASH-IF best PhD dissertation
- Advisor: Roger Zimmermann, Co-Advisor: Ali C. Begen

University of Mohamed El Bachir El Ibrahimi

Algeria

M.S. in Computer Science

June 2009–2011

University of Larbi Ben M'hidi

Algeria

B.S. in Computer Science

June 2006–2009

EMPLOYMENT

Concordia University

Canada

Assistant Professor in Computer Science

Sep 2022–Current

National University of Singapore

Singapore

Postdoctoral Research Fellow in Computer Science

June 2019–Sep 2022

- Project: different topics in networked media streaming and immersive media (metaverse)

Atlastream Pte. Ltd.

Singapore

Co-Founder (Shareholder)

Jan 2022–Current

- Atlastream develops solutions for prominent video streaming experience
- NUS spin-off startup

Atlastream Pte. Ltd.

Singapore

Co-Founder (CTO)

March 2019–Jan 2022

- Atlastream develops solutions for prominent video streaming experience
- NUS spin-off startup

Bitmovin Inc.

Austria

Research Intern

Spring 2018

- Mentors: Christian Timmerer and Daniel Weinberger (Principal Solutions Architect).

National University of Singapore
PhD Student and Teaching Assistant (as part of PhD requirements)

Singapore
January 2015–June 2019

United Arab Emirates University
Research Intern

UAE
Spring 2013

– Mentor: Saad Harous

University of Mohamed El Bachir El Ibrahimi
Teaching Assistant

Algeria
September 2011–2012

AWARDS AND HONORS

- DASH-IF Excellence in DASH Award (2nd place) October 2021
- dash.js Contributor Awards (3rd place) October 2020
- Twitch’s Grand Challenge on Adaptation Algorithms for Near-Second Latency (2nd place) June 2020
- SIGMM Award for Outstanding PhD Thesis October 2019
- Best Poster at Computing Research Week November 2019
- DASH-IF Best PhD Dissertation Award (1st place) June 2019
- DASH-IF Excellence in DASH Award (1st place) June 2019
- The 7th Heidelberg Laureate Forum (HLF) 2019 September 2019
- The Global Young Scientists Summit (GYSS) September 2018
- Dean’s Graduate Research Excellence Award August 2018
- IEEE ICME Grand Challenges on DASH (1st place) July 2018
- DASH-IF Excellence in DASH Award (1st place) June 2018
- ACM MMSys Best Student Paper Award June 2017
- Dean’s Graduate Research Achievement Awards September 2017
- Singapore International Graduate Award (SINGA) Scholarship Recipient January 2015

PUBLICATIONS (CITATIONS: 1368 | H-INDEX: 16)

- [1] A. **Bentaleb**, M. N. Akcay, M. Lim, A. C. Begen, and R. Zimmermann, “Meta reinforcement learning for rate adaptation”, in *IEEE INFOCOM*, 2023.
- [2] A. **Bentaleb**, M. N. Akca, M. Lim, A. C. Begen, and R. Zimmermann, “Bandwidth prediction in low-latency media transport”, in *ACM MHV*, 2023.
- [3] A. **Bentaleb**, R. Farahani, F. Tashtarian, H. Hellwagner, and R. Zimmermann, “Which cdn to download from? a client and server strategies”, in *ACM MHV*, 2023.
- [4] R. Farahani, A. **Bentaleb**, S. Mohammed, and H. Hellwagner, “Cp-steering: Cdn-and protocol-aware content steering solution for http adaptive video streaming”, in *ACM MHV*, 2023.
- [5] R. Farahani, A. **Bentaleb**, C. Timmerer, S. Mohammed, and H. Hellwagner, “Sarena: Sfc-enabled architecture for adaptive video streaming applications”, in *IEEE ICC*, 2023.
- [6] F. Tashtarian, A. **Bentaleb**, H. Amirpour, B. Taragh, T. Christian, H. Hermann, and R. Zimmermann, “LALISA: Adaptive Bitrate Ladder Optimization in HTTP-based Adaptive Live Streaming”, in *IEEE/IFIP NOMS*, 2023.
- [7] X. Huang, C. Li, A. **Bentaleb**, R. Zimmermann, and G. Zhai, “Xgc-vqa: A unified video quality assessment model for user, professionally, and occupationally-generated content”, in *IEEE ICME*, 2023.
- [8] C. Li, M. Lim, A. **Bentaleb**, and R. Zimmermann, “A real-time blind quality-of-experience assessment metric for http adaptive streaming”, in *IEEE ICME*, 2023.
- [9] R. Farahani, A. **Bentaleb**, E. Çetinkaya, C. Timmerer, R. Zimmermann, and H. Hellwagner, “Hybrid p2p-cdn architecture for live video streaming: An online learning approach”, in *IEEE GLOBECOM*, 2022.

- [10] M. Nguyen, B. Taraghi, A. **Bentaleb**, R. Zimmermann, and C. Timmerer, "Cadlad: Device-aware bitrate ladder construction for http adaptive streaming", in *2022 18th International Conference on Network and Service Management (CNSM)*, IEEE, 2022, pp. 198–204.
- [11] A. **Bentaleb**, M. N. Akcay, M. Lim, A. C. Begen, and R. Zimmermann, "Bob: Bandwidth prediction for real-time communications using heuristic and reinforcement learning", *IEEE Transactions on Multimedia*, vol. x, no. x, p. x, 2022, paper accepted, [ISI IF: 8.182].
- [12] A. **Bentaleb**, Z. Zhan, F. Tashtarian, M. Lim, S. Harous, T. Christian, H. Hermann, and R. Zimmermann, "Low Latency Live Streaming Implementation in DASH and HLS", in *ACM MM*, 2022.
- [13] F. Tashtarian*, A. **Bentaleb***, A. Erfanian, H. Hellwagner, C. Timmerer, and R. Zimmermann, "HxL3: Optimized Delivery Architecture for HTTP Low-Latency Live Streaming", *IEEE Transactions on Multimedia*, vol. x, no. x, p. x, 2022, paper accepted, [ISI IF: 8.182], *: **Equal Contribution**.
- [14] B. Taraghi, A. **Bentaleb**, C. Timmerer, R. Zimmermann, and H. Hellwagner, "Cadvice or how to find the sweet spots of abr systems", in *Proceedings of the 1st Mile-High Video Conference*, 2022, pp. 94–94.
- [15] M. Lim, M. N. Akcay, A. **Bentaleb**, A. C. Begen, and R. Zimmermann, "The benefits of server hinting when dashing or hlsing", in *Proceedings of the 1st Mile-High Video Conference*, 2022, pp. 52–55.
- [16] R. Farahani, H. Amirpour, F. Tashtarian, A. **Bentaleb**, C. Timmerer, H. Hellwagner, and R. Zimmermann, "Richter: Hybrid p2p-cdn architecture for low latency live video streaming", in *Proceedings of the 1st Mile-High Video Conference*, 2022, pp. 87–88.
- [17] N. Lakshmanan, A. **Bentaleb**, B. Choi, R. Zimmermann, J. Han, and M. S. Kang, "On privacy risks of watching youtube over cellular networks with carrier aggregation", *Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies*, vol. 6, no. 1, pp. 1–22, 2022.
- [18] A. C. Begen, M. N. Akcay, A. **Bentaleb**, and A. Giladi, "Adaptive streaming of content-aware-encoded videos in dash. js", *SMPTE Motion Imaging Journal*, vol. 131, no. 4, pp. 30–38, 2022.
- [19] A. C. Begen, A. **Bentaleb**, D. Silhavy, S. Pham, R. Zimmermann, and W. Law, "Road to salvation: Streaming clients and content delivery networks working together", *IEEE Communications Magazine*, vol. 59, no. 11, pp. 123–128, 2021, [ISI IF: 11.05].
- [20] F. Tashtarian, R. Falanji, A. **Bentaleb**, A. Erfanian, P. Mashhadi, C. Timmerer, H. Hellwagner, and R. Zimmermann, "Quality optimization of live streaming services over http with reinforcement learning", in *2021 IEEE Global Communications Conference (GLOBECOM)*, IEEE, 2021, pp. 1–6.
- [21] F. Tashtarian, B. **Abdelhak**, R. Farahani, M. Nguyen, C. Timmerer, H. Hellwagner, and R. Zimmermann, "A distributed delivery architecture for user generated content live streaming over http", in *2021 IEEE 46th Conference on Local Computer Networks (LCN)*, IEEE, 2021.
- [22] A. **Bentaleb**, M. Lim, M. N. Akcay, A. C. Begen, and R. Zimmermann, "Common media client data (cmcd) initial findings", in *Proceedings of the 31st ACM Workshop on Network and Operating Systems Support for Digital Audio and Video*, 2021.
- [23] P. K. Yadav, A. **Bentaleb**, M. Lim, J. Huang, W. T. Ooi, and R. Zimmermann, "Playing chunk-transferred dash segments at low latency with qlive", in *Proceedings of the 12th ACM Multimedia Systems Conference*, 2021, pp. 51–64.
- [24] M. J. Khan, A. **Bentaleb**, and S. Harous, "Can accurate future bandwidth prediction improve volumetric video streaming experience?", in *2021 International Wireless Communications and Mobile Computing (IWCMC)*, IEEE, 2021.
- [25] S. Tisa, A. **Bentaleb**, S. Harous, *et al.*, "Video qoe inference with machine learning", in *2021 International Wireless Communications and Mobile Computing (IWCMC)*, IEEE, 2021, pp. 1048–1053.
- [26] A. **Bentaleb**, A. C. Begen, and R. Zimmermann, "Catching the Moment with LoL⁺ in Twitch-Like Low-Latency Live Streaming Platforms", *IEEE Transactions on Multimedia*, vol. x, no. x, p. x, 2021, paper accepted, [ISI IF: 8.182].
- [27] T. Babak, A. **Bentaleb**, T. Christian, H. Hermann, and R. Zimmermann, "Understanding Quality-of-Experience of Heuristic-based HTTP Adaptive Bitrate Algorithms", in *ACM NOSSDAV*, 2021.
- [28] S. Hammoudi, A. **Bentaleb**, S. Harous, and Z. Aliouat, "Scheduling in IEEE 802.15.4e Time Slotted Channel Hopping: A Survey", in *IEEE UEMCON*, 2020.
- [29] A. **Bentaleb**, A. C. Begen, S. Harous, and R. Zimmermann, "Data-Driven Bandwidth Prediction Models and Automated Model Selection for Low Latency", *IEEE Transactions on Multimedia*, vol. 1, no. 1, pp. 1–15, 2020, [ISI IF: 8.182].
- [30] M. J. Khan, S. Harous, and A. **Bentaleb**, "Client-driven Adaptive Bitrate Techniques for Media Streaming over HTTP: Initial Findings", in *IEEE EIT*, 2020.
- [31] A. **Bentaleb**, C. Timmerer, A. C. Begen, and R. Zimmermann, "Performance Analysis of ACTE: A Bandwidth Prediction Method for Low-Latency Chunked Streaming", *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, vol. 16, no. 2s, pp. 1–24, 2020, [ISI IF: 4.475].

- [32] S. Tisa, A. **Bentaleb**, and S. Harous, “Inferring Quality of Experience for Adaptive Video Streaming over HTTPS and QUIC”, in *IEEE IWCMC*, 2020.
- [33] M. Lim, M. N. Akcay, A. **Bentaleb**, A. C. Begen, and R. Zimmermann, “When They Go High, We Go Low: Low-Latency Live Streaming in dash. js With LoL”, in *ACM MMSys*, 2020, **Runner-up in the Twitch’s Grand Challenge**.
- [34] A. **Bentaleb**, P. K. Yadav, W. T. Ooi, and R. Zimmermann, “DQ-DASH: A Queuing Theory Approach to Distributed Adaptive Video Streaming”, *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, vol. 16, no. 1, pp. 1–24, 2020, [ISI IF: 4.475].
- [35] Y. Harbi, Z. Aliouat, A. Refoufi, S. Harous, and A. Bentaleb, “Enhanced Authentication and Key Management Scheme for Securing Data Transmission in the Internet of Things”, *Ad Hoc Networks*, vol. 94, p. 101948, 2019, [ISI IF: 3.64].
- [36] A. E. Al-Issa, A. **Bentaleb**, A. A. Barakabitze, T. Zinner, and B. Ghita, “Bandwidth Prediction Schemes for Defining Bitrate Levels in SDN-enabled Adaptive Streaming”, in *IEEE CNSM*, 2019.
- [37] Y. Harbi, Z. Aliouat, S. Harous, A. **Bentaleb**, and A. Refoufi, “A Review of Security in Internet of Things”, *Wireless Personal Communications*, vol. 108, no. 1, pp. 325–344, 2019, [ISI IF: 1.06].
- [38] A. **Bentaleb**, A. C. Begen, S. Harous, and R. Zimmermann, “Game of Streaming Players: Is Consensus Viable or an Illusion?”, *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, vol. 15, no. 2s, pp. 1–30, 2019, [ISI IF: 4.47].
- [39] A. **Bentaleb**, C. Timmerer, A. C. Begen, and R. Zimmermann, “Bandwidth prediction in low-latency chunked streaming”, in *ACM NOSSDAV*, 2019, **DASH-IF Excellence in DASH Award (1st place)**.
- [40] A. E. Al-Issa, A. **Bentaleb**, T. Zinner, I.-H. Mkwawa, and B. Ghita, “BBGDASH: A Max-Min Bounded Bitrate Guidance for SDN Enabled Adaptive Video Streaming”, in *IEEE ICIN*, 2019.
- [41] Y. Harbi, Z. Aliouat, S. Harous, and A. **Bentaleb**, “Secure Data Transmission Scheme based on Elliptic Curve Cryptography for Internet Of Things”, in *Springer MISC*, Springer, 2018.
- [42] A. **Bentaleb**, A. C. Begen, S. Harous, and R. Zimmermann, “A Distributed Approach for Bitrate Selection in HTTP Adaptive Streaming”, in *ACM MM*, 2018.
- [43] A. **Bentaleb**, A. C. Begen, and R. Zimmermann, “ORL-SDN: Online Reinforcement Learning for SDN-enabled HTTP Adaptive Streaming”, *ACM Transactions on Multimedia Computing, Communications, and Applications (TOMM)*, vol. 14, no. 3, pp. 1–28, 2018, [ISI IF: 4.47].
- [44] A. **Bentaleb**, B. Taani, A. C. Begen, C. Timmerer, and R. Zimmermann, “A Survey on Bitrate Adaptation Schemes for Streaming Media over HTTP”, *IEEE Communications Surveys & Tutorials*, vol. 21, no. 1, pp. 562–585, 2018, [ISI IF: 23.7].
- [45] A. **Bentaleb**, A. C. Begen, and R. Zimmermann, “Game Theory based Bitrate Adaptation for Dash. Js Reference Player”, in *IEEE ICME*, IEEE, 2018, **Grand Challenges on DASH (1st place)**.
- [46] A. **Bentaleb**, A. C. Begen, S. Harous, and R. Zimmermann, “Want to Play DASH? A Game Theoretic Approach for Adaptive Streaming over HTTP”, in *ACM MM*, 2018, **Best Student Paper Award & DASH-IF Excellence in DASH Award**.
- [47] A. **Bentaleb**, A. C. Begen, and R. Zimmermann, “QoE-aware Bandwidth Broker for HTTP Adaptive Streaming Flows in an SDN-enabled HFC Network”, *IEEE Transactions on Broadcasting*, vol. 64, no. 2, pp. 575–589, 2018, [ISI IF: 3.419].
- [48] A. **Bentaleb**, S. Harous, and A. Boubetra, “A k-hop Scalable Management Scheme for Large Scale Mobile ad-hoc Networks”, *Wireless Personal Communications*, vol. 96, no. 4, pp. 6239–6271, 2017, [ISI IF: 1.06].
- [49] A. **Bentaleb**, A. C. Begen, R. Zimmermann, and S. Harous, “SDNHAS: An SDN-enabled Architecture to Optimize QoE in HTTP Adaptive Streaming”, *IEEE Transactions on Multimedia*, vol. 19, no. 10, pp. 2136–2151, 2017, [ISI IF: 6.05].
- [50] A. **Bentaleb**, A. C. Begen, and R. Zimmermann, “SDNDASH: Improving QoE of HTTP Adaptive Streaming Using Software Defined Networking”, in *ACM MM*, 2016.
- [51] A. **Bentaleb**, S. Harous, and A. Boubetra, “A New Topology Management Scheme for Large Scale Mobile ad-hoc Networks”, in *IEEE EIT*, IEEE, 2015.
- [52] A. **Bentaleb**, S. Harous, and A. Boubetra, “A Scalable Clustering Scheme and its Performance Evaluation”, *International Journal of Pervasive Computing and Communications*, vol. 10, no. 1, pp. 27–42, 2014, [ISI IF: 0.91].
- [53] A. **Bentaleb**, S. Harous, and A. Boubetra, “A Topology Management Scheme with Scalability and QoS Guarantee for Large Scale Mobile Ad Hoc Networks in Urban Environment”, in *2nd International Conference on New Technologies and Communication*, 2014.
- [54] A. **Bentaleb**, S. Harous, and A. Boubetra, “A Weight based Clustering Scheme for Mobile ad-hoc Networks”, in *ACM MOMM*, 2013.

- [55] H. Lakhlef, A. **Bentaleb**, J.-F. Myoupo, A. Boubetra, and S. Harous, “Cliques and Clusters based Hierarchical Scheme for Sensor Networks Partitioning”, in *IEEE GCC*, IEEE, 2013.
- [56] A. **Bentaleb**, A. Boubetra, and S. Harous, “Survey of clustering Schemes in Mobile ad-hoc Networks”, *Communications and Network*, vol. 5, no. 02, p. 8, 2013, [**ISI IF: 1.79**].

PROFESSIONAL SERVICE

Technical Program Committee

- 2023: ACM MMSys, ACM MM, ACM NOSSDAV, IEEE ICME
- 2022: ACM MMSys, ACM MM, ACM NOSSDAV, IEEE ICME
- 2021: ACM MMSys, ACM MM, ACM NOSSDAV, IEEE ICME
- 2020: ACM MMSys, ACM MM, ACM NOSSDAV, IEEE ICME
- 2019: ACM MMSys, ACM MM, ACM NOSSDAV, IEEE ICME

Organizing Committee

- 2023: ACM MMSys, ACM MM, ACM NOSSDAV
- 2022: ACM MMSys, ACM MM, ACM NOSSDAV
- 2021: ACM MMSys, ACM MM, ACM NOSSDAV
- 2020: ACM MMSys, ACM MM, ACM NOSSDAV
- 2019: ACM MMSys, ACM MM, ACM NOSSDAV
- 2018: IEEE ICNP

Reviewer For

- **Journals:** IEEE Transaction on Multimedia (IEEE TMM), IEEE Communications Letters, ACM Transactions on Multimedia Computing Communications and Applications (TOMM), IEEE Access, IEEE Communications Magazine, KSII Transactions on Internet and Information Systems, Springer Wireless Personal Communications, EURASIP Journal on Wireless Communications and Networking, Elsevier Computer Networks, Elsevier Journal of Network and Computer Applications, IEEE Letters, Transactions on Mobile Computing, IEEE Transactions on Network and Service Management (IEEE TNSM), Elsevier Signal Processing (Image Communication), Elsevier Ad Hoc Networks, IEEE Transactions on Vehicular Technology, IEEE Transactions on Circuits and Systems for Video Technology.
- **Conferences:** ACM MMSys, ACM MM, IEEE ICC, IEEE INFOCOM, IEEE ICME, ACM NOSSDAV

GRANTS

- **From Capturing to Rendering: AI-powered Immersive Media Delivery**, NSERC Discovery PI 2023–2028
- **Improving End-user QoE in HAS**, UAEU Program for Advanced Research 2018–2022
Co-PI with Saad Harous and Roger Zimmermann.
- **AI-based Techniques for Low Latency Live Streaming**, UAEU Program for Advanced Research 2021–2025
Co-PI with Saad Harous and Roger Zimmermann.
- **Quality-Aware Streaming Implementation for dash.js**, Comcast Innovation Fund 2020–2021
PI.

TEACHING

- **Main Instructor** at Concordia University Winter 2023
Data Communication and Computer Networks (COMP 445)
- **Main Instructor** at Concordia University Winter 2023
Computer Networks and Protocols (COMP 6461)
- **Teaching Assistant** at National University of Singapore Summer 2019
Summer School on DASH (SWS3021)
- **Teaching Assistant** at National University of Singapore Spring 2019
Systems Support for Continuous Media (CS5248)
- **Teaching Assistant** at National University of Singapore Spring 2018
Embedded Systems Design Project (CG3002)
- **Teaching Assistant** at National University of Singapore Spring 2017
Software Engineering Project (CS3203)
- **Teaching Assistant** at National University of Singapore Spring 2016
Data Structure and Algorithms (CS1020)
- **Teaching Assistant** at National University of Singapore Spring 2015
Programming Methodology (CS1010)
- **Teaching Assistant** at University of Mohamed El Bachir El Ibrahimi 2011–2012
Programming Languages

ADVISING

- **PostDoc:** Quang Huy Duong (Concordia University).
- **PhD Students:** Most Husne Jahan (Concordia University), Muhammad Talha Zia (Concordia University), Quang Anh Nguyen (Concordia University).
- **MSc Students:** Zhan Zhengdao (NUS), Adwait Rajjvaed Sambare (Concordia University), Jashanjot Singh Sidhu (Concordia University)
- **Research Interns and Undergraduate :** Jeremy Ouellette (Concordia University), .

INVITED TALKS

- HTTP based Low Latency Live Video Streaming Challenges and Solutions, Computing Research Week, NUS, Singapore, 2020.
- Enabling Optimizations of Video Delivery in HTTP Adaptive Streaming, ACM MM, Nice, France, 2019.
- Game of Streaming Players: Is Consensus Viable or an Illusion?, Dagstuhl Seminar 19381, Wadern, Germany, 2019.
- Bandwidth Prediction in Low-latency Chunked Streaming, ACM MMSys, USA, 2019.
- Game Theory in Adaptive Video Streaming, Computing Research Week, NUS, Singapore, 2019.
- A Distributed Approach for Bitrate Selection in HTTP Adaptive Streaming, ACM MM, Korea, 2018.
- Game Theory Based Bitrate Adaptation for dash.js Reference Player, IEEE ICME, USA, 2018.
- A Distributed Approach for Bitrate Selection in HTTP Adaptive Streaming, Alpen-Adria-Universitat Klagenfurt, Austria, 2018.
- Game Theory and DASH, Bitmovin Inc., Austria, 2018.
- Want to Play DASH? A Game Theoretic Approach for Adaptive Streaming over HTTP, ACM MMSys, Amsterdam, Netherlands, 2018.
- SDNDASH: Improving QoE of HTTP Adaptive Streaming Using Software Defined Networking, ACM Multimedia, Amsterdam, Netherlands, 2016.

- Scalability and QoS for Mobile Ad-hoc Networks, Doctoral Symposium at University of Mohamed El Bachir El Ibrahimi, Algeria, 2015.

INDUSTRY IMPACT AND PATENTS

- **LoL and LoL⁺** gained a lot of attraction from Industry and is currently integrated with the open-source dash.js reference player.
- **AMP**– a bandwidth prediction models and auto-selection technique for low latency live streaming is gaining interest from some video streaming Industry.
- **DQ-DASH** (Method and device for streaming content, US20220030308A1) has been patented by NUS and licensed to Atlastream, and is in the process for commercial use.
- **ACTE** (Chunk-based prediction adaptation logic, US20210289013A1) has been patented by Bitmovin and in the process for large deployment.

ENTREPRENEURSHIP

Co-Founder at Atlastream, an NUS spin-off startup in the video streaming field.

SELECTED PROJECTS

See full list of projects on my personal website

- **Transport Layer Protocols and Live DASH (2020-current)**: The aim of this project is to investigate the impact of different transport layer protocols on low latency adaptive video streaming.
- **AI-based Bandwidth Prediction techniques for Low Latency Live Streaming (2020-current)**: The aim of this project is to use different AI-based techniques to improve bandwidth prediction tasks in low latency live video streaming.
- **Learning-based Adaptation (2020-current)**: We investigated new paradigm based on machine and deep learning techniques for solving challenging QoE optimization problems in HAS-based video delivery system.
- **6DoF Adaptation (2020-current)**: The aim of this project is to propose advanced algorithms that deliver ultra-low latency 6DoF contents.
- **QoE Inference Form Encrypted Traffic (2019-current)**: We investigated how to better use AI techniques to infer QoE (quality selected, re-buffering, and startup delay) of different OTT services such us Netflix, Youtube, and Twitch.
- **Low Latency Live Streaming (2018-current)**: We investigated how to achieve near-second end-to-end latency in DASH and HLS.
- **Queuing Theory and Multi-CDN (2018-2020)**: We investigated how to use queuing theory and multi-CDN for better segment scheduling in adaptive video streaming.
- **Game Theory Adaptation (2017-2019)**: We investigated how to formulate the ABR decisions in DASH using game theoretic approach, when multiple players share the same network.
- **SDN-Based Adaptation (2015-2017)**: We investigated how a central entity like Software Defined Networking (SDN) controller assist the video players in their bitrate selection and bandwidth allocation for better QoE.