Shashi Raj Pandey

Department of Electronic Systems, Connectivity Section, Aalborg University (AAU), Denmark
Address: Fredrik Bajers Vej 7, 9220 Aalborg Ø, DK, C1-111
Personal Webpage: `https://shashirajpandey.github.io/`
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CURRENT RESEARCH

I work at the intersection of wireless networks, distributed machine learning (DML), and economics.

ACADEMIC POSITION

Postdoctoral Researcher, Connectivity Section, AAU — Sept. 2021 - Present

- Advisor: Prof. Petar Popovski
- Understanding the valuation of data on learning, privacy and pricing
  - Data Markets and Econometrics
  - Distributed ML, Semantic Communications and Causal Reasoning

INDUSTRY POSTIONS

Network Engineer, Huawei Technologies — 2013 - 2016
Worked for Nepal Telecom 10M GSM Line Project (2G/3G)
Intern, Network Operations, Subisu Cablenet Pvt. Ltd., Nepal — Summer 2013

EDUCATION

Ph.D. in Computer Science and Engineering — 2016 - 2021
Kyung Hee University, Yogin-si, South Korea

- Thesis title: **Federated Learning over Wireless Networks: Incentive Design and Game-theoretic Analysis**
- Advisor: Prof. Choong Seon Hong

B.E. in Electrical and Electronics Engineering — September, 2013
Kathmandu University, Dhulikhel, Nepal
Specialization in Communication

ACADEMIC EXPERIENCE

Aalborg University, Denmark
Teaching, Dependable and Secure Distributed Systems (CE7-NDS) — Fall 2022
Student's Project Supervision, EIT-5 (Ung), CT-9 (MSc)

Kyung Hee University, Networking Intelligence Lab, South Korea
Graduate Research Assistant with Prof. Choong Seon Hong
and Dr. Nguyen H. Tran (The University of Sydney) — 2016 - Present

Kyung Hee University, DoCSE
Teaching Assistant *with Dr. Nguyen H. Tran* (at present with The University of Sydney) — 2016 - 2018
CSE-710100 Advanced Probability and Statistics
CSE-710400 Queuing Theory
CSE-710200 Optimization Theory
CSE-840200 Network Optimization
AMTH 1004-03 Introduction to Linear Algebra

- Answer student's questions and clarify them on Piazza
- Coordinate for assignments and course materials

- Develop new problem sets and assist for tutorials
- Manage classroom (approx. 25 students in each class)

Kyung Hee University, Networking Lab 2016 - Present
Fault Resilient IoT Networks, IoT Project
Ministry of Science and ICT, Republic of Korea
Collaborators: *Kyung Hee University, KAIST, Seoul National University, Data Alliance (Industry Partner)*
M2M Communication Module, System Implementation
Developed softwares:

- CoAP-based IoT Node Connection Module
  Registration Number: C-2021-003005 2021
- CoAP/MQTT-based IoT Module for Network Information Collection
  Registration Number: C-2021-003006 2021
- Multi-threaded Server Module
  Registration Number: C-2018-029163 2018
- Raspberry Pi Module
  Registration Number:C-2018-029164 2018
- Data Collection Module
  Registration Number: C-2018-029165 2018
- Client Communication Module
  Registration Number: C-2018-029166 2018

Kathmandu University, DoEEE 2009 - 2013
Modeling and Simulation of WiMAX/IEEE 802.16e Physical Layer
Undergraduate Final Year Research Project
*Miscellaneous Projects:
3D LED-Display, Wall Following Robot, IR Switch, Filters Design

SELECTED SCHOLARSHIPS AND AWARDS

Best PhD Thesis Nominee at Kyung Hee University, DoCSE 2021
Excellent Paper at Korea Software Congress, KIISE 2021
Student Best Paper Award at APNOMS 2019
Ministry of Science and ICT Fellowship, Republic of Korea 2018 - 2021
Brain Korea 21st Century Plus Fellowship 2018 - 2021
Presidential Scholarship at Kyung Hee University 2016 - 2018
Best Paper at Korea Software Congress, KIISE 2018
Outstanding Paper at Korea Software Congress, KIISE 2017
Honorable Award for Bravery at HUAWEI - for contribution in restoring Nepal Telecom's network services in Nepal Earthquake 2015
Top 3 Highest Score in Huawei Nepal Engineering Foundation Exam 2014
Best New Employee Award, Huawei Technologies Nepal Pvt. Ltd 2014
Outstanding UNG Project Award, Nepal Telecom Authority 2013
Nuchenarayan Ramdevi Takhache Sirapa Award 2006
- presented to a student who secure highest academic position
Excellent Academic Performance Award - Gold Medalist 2006

PREPRINTS

[P6] **Pandey, S.R.,** Nguyen, L.D. and Popovski, P., 2022.**"FedToken: Tokenized Incentives for Data Contribution in Federated Learning."** (NeurIPS 2022 Workshop, under review).

[P5] Christensen, R.B., **Pandey, S.R.**, and Popovski, P., 2022.**"Semi-Private Computation of Data Similarity with Controlled Leakage."**(under review, *IEEE Transactions on Information Forensics & Security*)

[P4] **Pandey, S.R.**, Pinson, P., and Popovski, P., 2022.**"Participation and Data Valuation in IoT Data Markets through Distributed Coalitions"**. (under review, *IEEE Transactions on Control of Network Systems*)

[P3] Nguyen, M. N., Le, H. Q., **Pandey, S.R.**, and, Hong, C.S., 2022.**"CDKT-FL: Cross-Device Knowledge Transfer using Proxy Dataset in Federated Learning."** (NeurIPS 2022, under review)

[P2] Nguyen, L. D., **Pandey, S.R.**, Beatriz, S., Broering, A., & Popovski, P. (2021). **"A Marketplace for Trading AI Models based on Blockchain and Incentives for IoT Data"** (under review)

[P1] Popovski, P., Chiariotti, F., Croisfelt, V., Kalør, A.E., Leyva-Mayorga, I., Marchegiani, L., Pandey, S.R., and Soret, B., 2021."**Internet of Things (IoT) Connectivity in 6G: An Interplay of Time, Space, Intelligence, and Value.**"

JOURNAL PUBLICATIONS

*__Selected Publications__

[J20] **Pandey, S.R.**, Nguyen, L.D. and Popovski, P., 2022.**"A Contribution-based Device Selection Scheme in Federated Learning."** (in press, *IEEE Communications Letters*)

[J19] Nguyen, M. N., **Pandey, S.R.**, Dang, T.N., Huh, E.N., Hong, C.S., Tran, N. H. and Saad, W., 2022.**"Self-organizing Democratized Learning: Towards argescale Distributed Learning Systems"**. (in press, *IEEE Transactions on Neural Networks and Learning Systems*).

[J18] **Pandey, S.R.**, Nguyen, M.N., Dang, T.N., Tran, N.H., Thar, K., Han, Z. and Hong, C.S., 2020. **"Edge-assisted Democratized Learning Towards Federated Analytics"**. arXiv preprint arXiv:2012.00425. (in press, *IEEE Internet of Things Journal*)

[J17] Zaw, C.W., **Pandey, S.R.**, Kim, K., and Hong, C.S.**"Energy-aware Resource Management for Federated Learning in Multi-access Edge Computing Systems."**(in press, *IEEE Access*)

[J16] Le, T.H.T., Tran, N.H., Tun, Y.K., Nguyen, M.N., **Pandey, S.R.**, Han, Z. and Hong, C.S., 2020. **"An Incentive Mechanism for Federated Learning in Wireless Cellular network: An Auction Approach"**. arXiv preprint arXiv:2009.10269. (in press, *IEEE Transactions on Wireless Communications*)

[J15] Alsenwi, M., Tran, N. H., Bennis, M., **Pandey, S. R.**, Bairagi, A. K., and Hong, C. S., 2020. **Intelligent Resource Slicing for eMBB and URLLC Coexistence in 5G and Beyond: A Deep Reinforcement Learning Based Approach.** arXiv preprint arXiv:2003.07651. (in presss, *IEEE Transactions on Wireless Communications*)

[J14] **Pandey, S.R.**, Kim, K., Alsenwi, M., Tun, Y.K., Han, Z. and Hong, C.S., 2020. Latency-sensitive Service Delivery with UAV-Assisted 5G Networks. 2021. (in press, *IEEE Wireless Communications Letters*)

[J13] Tun, Y.K., Park, Y.M., Tran, N.H., Saad, W., **Pandey, S.R.** and Hong, C.S., 2020. **"Energy-efficient resource management in UAV-assisted mobile edge computing"**. *IEEE Communications Letters.*

[J12] Manzoor, A., Kazmi, S.M., **Pandey, S.R.** and Hong, C.S., 2020. **"Contract-based Scheduling of URLLC Packets in Incumbent EMBB Traffic"**. *IEEE Acess.*

[J11] Nguyen, M. N., **Pandey, S. R.**, Thar, K., Tran, N. H., Chen, M., Saad, W., and Hong, C. S., 2020. " **Distributed and Democratized Learning: Philosophy and Research Challenges**". arXiv preprint arXiv:2003.09301v1. (in press, *IEEE Computational Intelligence Magazine*).

[J10] **Pandey, S. R.*** Khan, L. U.*(*co-first author, equal contribution), Tran, N. H., Saad, W., Han, Z., Nguyen, M. N., and Hong, C. S. "**Federated Learning for Edge Networks: Resource Optimization and Incentive Mechanism".** *IEEE Communication Magazine*, 58, no. 10 (2020): 88-93.

[J9] **S. R. Pandey**, N. H. Tran, M. Bennis, Y. K. Tun, A. Manzoor, and C. S. Hong., 2020. " **A Crowdsourcing Framework for On-Device Federated Learning**". *IEEE Transactions on Wireless Communications.* DOI:10.1109/TWC.2020.2971981.

[J8] Suhail, S., Hussain, R., Abdellatif, M., **Pandey, S.R.**, Khan, A. and Hong, C.S., 2020. "**Provenance-enabled Packet Path Tracing in the RPL-based Internet of Things**". *Computer Networks*

[J7] Suhail, S., **Pandey, S.R.**, and Hong, C.S., 2020. "**Using Provenance to Detect Selective Forwarding Attack in RPL-Based Internet of Things.**". *KIISE Transactions on Computing Practices.*

[J6] Manzoor, A., Kim, K., **Pandey, S. R.**, Tran, N.H., Saad, W., Kazmi, S.A., **Pandey, S.R.** and Hong, C.S., 2020. "**Ruin Theory for Energy-Efficient Resource Allocation in UAV-assisted Cellular Networks**". (in press, *IEEE Transactions on Communications*)

[J5] Tun, Y.K., Ndikumana, A., **Pandey, S.R.**, Han, Z. and Hong, C.S.,. "**Joint Radio Resource Allocation and Content Caching in Heterogeneous Virtualized Wireless Networks**". *IEEE Access.* (in press)

[J4] Alsenwi, M., Yaqoob, I., **Pandey, S.R.**, Tun, Y.K., Bairagi, A.K., Kim, L.W., and Hong, C.S., " **Towards Coexistence of Cellular and WiFi Networks in Unlicensed Spectrum: A Neural Networks Based Approach**". *IEEE Access, vol. 7, pp. 110023 - 110034, Aug. 2019.*

[J3] Tun, Y.K., Tran, N.H., Ngo, D.T., **Pandey, S.R.**, Han, Z. and Hong, C.S.,. "**Wireless Network Slicing: Generalized Kelly Mechanism Based Resource Allocation**". *IEEE Journal on Selected Areas in Communications, Vol. 37, pp. 1794-1807, July. 2019.*

[J2] Manzoor, A., Tran, N.H., Saad, W., Kazmi, S.A., **Pandey, S.R.** and Hong, C.S., 2018. "**Ruin Theory for Dynamic Spectrum Allocation in LTE-U Networks**". *IEEE Communications Letters*, 23(2), pp.366-369.

[J1] **Pandey, S.R.**, Suhail, S. and Hong, C.S., 2017, December. "**Q-learning Sup-**

plemented Crowdsensing Framework for Resource Constrained Devices". *KIISE Transactions on Computing Practices*, 24(7), pp. 1239-1241.

CONFERENCE PUBLICATIONS

*Selected Publications

[C9] **Pandey, S.R.**, Kim, K., Alsenwi, M., Tun, Y.K. and Hong, C.S., 2021, February. **"A Crowd-enabled Task Execution Approach in UAV Networks Towards Fog Computing**". In 2021 IEEE International Conference on Big Data and Smart Computing (BigComp). 17–20 January, Jeju Island, South Korea. (Selected for Oral Presentation)

[C8] Alsenwi, M., Tun, Y.K., **Pandey, S.R.**, Ei, N.N. and Hong, C.S., 2020, January. **"UAV-Assisted Multi-Access Edge Computing System: An Energy-Efficient Resource Management Framework"**. In 2020 International Conference on Information Networking (ICOIN) (pp. 214-219). Barcelona, Spain.

[C7] **S. R. Pandey**, N. H. Tran, M. Bennis, Y. K. Tun, Z. Han, and C. S. Hong. "**Incentivize to Build: A Crowdsourcing Framework for Federated Learning**". IEEE Global Communications Conference (GLOBECOM), Waikoloa, HI, USA, 9 - 13 December 2019. (Selected for Mobile Wireless Networks Interactive Presentation Session)

[C6] Alsenwi, M., Tun, Y.K., **Pandey, S.R.**, and Hong, C.S., 2019, January. "**A Hopfield Neural Networks Based Mechanism for Coexistence of LTE-U and WiFi Networks in Unlicensed Spectrum**". In 2017 20th Asia-Pacific Network Operations and Management Symposium (APNOMS). IEEE. 18 - 20 September, Matsue, Japan. (**Student Best Paper Award**)

[C5] Tun, Y.K., Alsenwi, M., **Pandey, S.R.**, Zaw, C.W. and Hong, C.S., 2019, January. "**Energy Efficient Multi-Tenant Resource Slicing in Virtualized Multi-Access Edge Computing**". In 2017 20th Asia-Pacific Network Operations and Management Symposium (APNOMS). IEEE. 18 - 20 September, Matsue, Japan.

[C4] Alsenwi, M., **Pandey, S.R.**, Tun, Y.K., Kim, K.T. and Hong, C.S., 2019, January. "**A Chance Constrained Based Formulation for Dynamic Multiplexing of eMBB-URLLC Traffics in 5G New Radio**". In 2019 International Conference on Information Networking (ICOIN) (pp. 108-113). IEEE. Kuala Lumpur, Malaysia. (Selected for Oral Presentation)

[C3] Tun, Y.K., **Pandey, S.R.**, Alsenwi, M., Zaw, C.W. and Hong, C.S. 2019, January. "**Weighted Proportional Allocation Based Power Allocation in Wireless Network Virtualization for Future Wireless Networks**". In 2019 International Conference on Information Networking (ICOIN) (pp. 284-289). IEEE. Kuala Lumpur, Malaysia. (Selected for Oral Presentation)

[C2] **Pandey, S.R.**, Alsenwi, M.**, Tun, Y.K. and Hong, C.S., 2019, February. "A Downlink Resource Scheduling Strategy for URLLC Traffic**". In 2019 IEEE International Conference on Big Data and Smart Computing (BigComp) (pp. 1-6). Kyoto University, Kyoto, Japan. (Selected for Oral Presentation)

[C1] **Pandey, S.R.** and Hong, C.S., 2018, January. "**Response Driven Efficient Task Load Assignment in Mobile Crowdsourcing**". In 2018 International Conference on Information Networking (ICOIN) (pp. 442-446). IEEE. Chiang Mai, Thailand.

PATENTS

[P2] **Pandey, S. R.**, Suhail, S., et.al., "**Smart Contract-based Method and System for Purchasing Resources for Seamless Media Streaming at Mobile Edge**". Reg. No. 1024351880000. KIPO. 2019. November. (Granted)

[P1] Suhail, S., **Pandey, S. R.**, Kim, Young-ki, and Hong, C.S., "**Method for Estimating Integrity of Packet in Sensor Network**". Reg. No. 1019482140000. KIPO. 2019. February. (Granted)

MEMBERSHIP AND ACADEMIC SERVICE

Reviewer, IEEE JSAC Series on ML4ComNet
Reviewer, IEEE JSAC-SI- EDL
Reviewer, IEEE Network
Reviewer, IEEE TWC
Reviewer, IEEE TNNLS
Reviewer, IEEE TCCN
Reviewer, IEEE TPDS
Reviewer, IEEE TVT
Reviewer, IEEE Communications Letters
Reviewer, IEEE Access
Reviewer, Journal of Communications and Networks
Reviewer, IEEE ICC, GLOBECOM, 5G-WF, SmartGridComm, IWCMC
Technical Program Committee, IEEE GLOBECOM 2022 NextGRAN Workshop, ACM EmeRTeS 2023 (Co-located with ACM ICDCN), ICN 2020, ICN 2021

Editorial Staff, IEEE The Institute's Editorial Advisory Board	2022-2024
Member-at-Large, IEEE ComSoc On-line Content Board	2021-Present
Member-at-Large, IEEE ComSoc YP	2019-2021
IEEE Member	2020 - present
IEEE ComSoc Member	2020 - present
Registered Engineer, Category A, NEC, Reg. **1002**	2013
University Coordinator, SONSIK	2018 - 2020
Editor, "Tech-Brief Newsletter", SEEE, KU	2012
Contributor, "Encipher 2012", KU	2012
Executive Member, Society of Electrical and Electronic Engineering (SEEE)	2011
Coordinator, Eco-Active Forum, KU	2010
Member, Amnesty International, KU Youth Network	
Member, Youth Redcross Circle, KU	
Lifetime member, NIST Alumni Association	