Wireless Network Personalization

The challenge	Current wireless networks are designed based on worst-case scenarios by over-provisioning/over-engineering to achieve a Quality-of-Service level acceptable to most users most of the time. Such static design decreases the efficacy and efficiency of wireless networks and results in the waste of precious and scarce resources (such as bandwidth and transmit power) with no guarantee of achieving desired user satisfaction on a personal level.
The solution	By utilizing user satisfaction feedback and machine-learning algorithms (as shown in Figs. 1 and 2), wireless network decisions are personalized and available resources can be managed so that maximum user satisfaction is achieved with minimal resources.
Key Benefits	✓ Maximal user satisfaction can be achieved with a minimum amount of resources. ✓ Resources not being used for personal applications can be utilized for more critical applications such as public safety and autonomous cars. ✓ Increased user satisfaction, as they do not have to pay for the provided extra bandwidth they do need or use.
Development Stage	Concept validation completed.
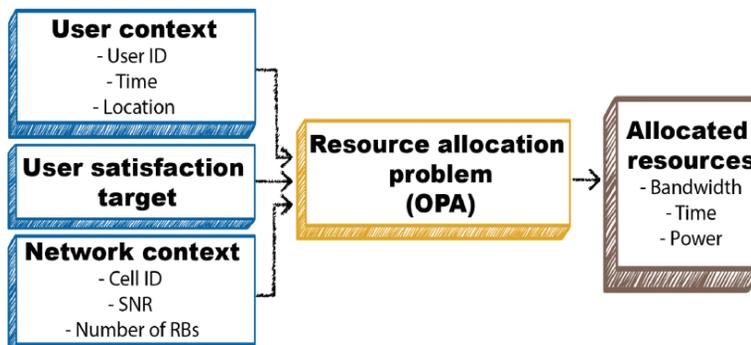
Figure 1: Inputs and outputs of the Optimum Personalized Resource Allocation (OPA) problem for wireless networks

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| Details	The Personalized Network provides: • A novel Zone-of-Tolerance model to quantify user satisfaction, and a framework to capture nonintrusive and real-time user feedback (Fig. 2), in wireless networks. • Multi-objective optimization to enable data-driven optimization of resources, revenue, and user satisfaction. • User feedback (i.e., satisfaction level) by utilizing machine learning and predictive analytics.
Research Team	Prof. Halim Yanikomeroglu (lead), R Alkurd, I Abualhaol
Patents	Patents pending in United States, Canada and Europe with international filing date of Aug. 29, 2019. See PCT publication, WO 2020/041883
Publications	R. Alkurd, I. Abualhaol, and H. Yanikomeroglu (2020), "Big data-driven and AI-based framework to enable personalization in wireless networks," IEEE Communications Magazine, vol. 58, no. 3, pp.18–24

Figure 2: Framework for Personalized Wireless Networks
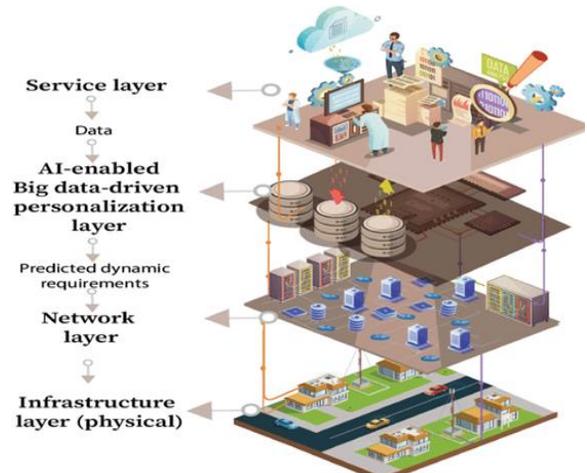
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