European Project Paves Way for AI-powered 6G Networks

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The DAEMON project, a European research initiative led by Spain's IMDEA Networks Institute, has successfully concluded, marking a significant step towards the development of future-proof 6G networks. Launched in January 2021, the project focused on integrating Artificial Intelligence (AI) into mobile network architecture, paving the way for faster, more ubiquitous mobile communication infrastructure with the potential to revolutionise everyday life.

DAEMON's core aim was to explore the practical application of AI in managing future generations of mobile networks (beyond 5G and 6G). The project achieved notable success, with its AI-driven architecture model being adopted by key standardisation bodies like the 5G Public Private Partnership (5G PPP) and the 6G Industry Alliance (6G IA). This paves the way for further integration into mainstream mobile network standards like those developed by 3GPP.

"The results have been a success since the AI-native architectural model proposed by DAEMON has been adopted by the 5G PPP and 6G IA Architecture Working Groups, from where it has the potential to be further pushed into main standardization bodies like 3GPP", said Marco Fiore, IMDEA Networks Research Professor and the DAEMON Project Coordinator.

"Also, the project has generated two pilots that are now deployed in the production network of Telefónica, five solutions that have been included in the European Commission Innovation Radar initiative, nine patents, and over 100 scientific papers. Together, all these constitute the significant legacy of DAEMON".

Researchers at IMDEA Networks, specifically the Network Data Science group, played a crucial role in the project. Their contributions included developing novel concepts like loss meta-learning to customise loss

functions for network-specific AI applications. Additionally, they demonstrated the feasibility of embedding AI models directly into programmable network hardware, enabling traffic flow classification with ultra-low latency (tens of nanoseconds).

Addressing Key Challenges

The DAEMON project tackled several critical challenges on the path to AI-powered networks:

- **Identifying Suitable Applications for AI:** The project conducted a comprehensive analysis to clearly define network management tasks that are best suited for AI solutions, providing valuable guidelines for the future of machine learning in mobile network automation.
- **Customised AI Solutions:** Leveraging the findings above, the project developed a range of AI algorithms tailored to the specific needs and limitations inherent in mobile network environments. These advancements represent a significant step forward in automating core network management functions.
- **Building an End-to-End AI-Native Architecture:** DAEMON pioneered the first-ever AI-native architecture model for mobile networks. This framework, aligned with current standardisation trends, facilitates the seamless coordination of numerous AI instances deployed within a network.

Scientific Legacy and Looking Ahead

The DAEMON project has demonstrably delivered groundbreaking research, with practical solutions implemented and tested in real-world network environments. The project's scientific impact is further underscored by over 30 publications in leading conferences and journals focused on computer networking and mobile computing.

While DAEMON has drawn to a close, the quest for faster, more reliable mobile networks continues with ORIGAMI, a new European project launched in January 2024. ORIGAMI builds upon DAEMON's legacy, aiming to further reduce network latency while boosting throughput and reliability. These advancements hold immense potential for diverse sectors and societal activities. The success of DAEMON has left an indelible mark on the evolution of mobile networks, and with projects like ORIGAMI driving innovation forward, the future promises a world of seamless connectivity empowered by cutting-edge technology.