

## Decoding the future of personalised advertising

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Digital advertising technology is reaching new heights, thanks in large part to pioneers like Chinmay Abhay Nerurkar, principal engineer at Microsoft Advertising. With an expertise in

machine learning and data science, Chinmay has been pushing the boundaries of what is possible in the realm of personalised advertising.

"I've always been captivated by the idea of systems that learn," says Chinmay. "Product recommendation systems like those using Graph Neural Networks (GNNs) allow us to learn on a sort of 'social network' of user preferences. It's like LinkedIn but for interests. For example, if you like hiking and also enjoy travel documentaries, these algorithms will catch that and offer relevant product recommendations to you."

GNNs work by traversing a multidimensional 'graph' that encapsulates various attributes of user behaviour. These graphs are then processed to identify patterns and to construct an intricate web of user interests. "The crux is to achieve this with minimal computational overhead," Chinmay adds. "That's where edge computing comes into play. Instead of sending all the data back to a central server, a lot of the heavy lifting is done on the user's device, making the whole system faster and more efficient."

However, the field isn't without its challenges. One significant issue is the 'cold start' problem. "When a new product or a user enters the system, there's not enough data to feed into the machine learning algorithms," explains Chinmay. "Solving this requires a hybrid approach, mixing collaborative and content-based filtering techniques, all while ensuring user privacy."

Speaking of privacy, it is an important but rather non-trivial problem. "How do you balance personalisation and privacy? It's like walking on a tightrope and the industry is continuously working to find that balance through differential privacy techniques," says Chinmay. These methods introduce 'noise' into the data to prevent the identification of individual users, without diluting the quality of the aggregate information.

Frequency management is another area that needs careful attention. "Ever get annoyed seeing the same ad repeatedly, everywhere you go online?" Chinmay asks. "That's what we're solving with cross-device frequency capping algorithms. They work by using Bayesian probability models to understand user-device interactions and optimise ad delivery."

Chinmay is also a strong advocate for mentorship in technological evolution. "A machine is only as good as the people behind it. The next generation of engineers must be ready to face new challenges, be it ethical considerations or unforeseen technical barriers."

Before concluding, Chinmay offers a glimpse into the future. "With the advent of 5G and even more powerful computing devices, the next challenge is real-time optimisation. Imagine adjusting your ad preferences in real-time as you walk into a store—that's where we're headed."

In the continually changing landscape of digital advertising, visionaries like Chinmay are at the forefront, tackling complex problems through ingenious solutions. His work is a testament to the transformative power of technology, and it sets the stage for the next chapter in the advertising industry—one that promises to be smarter, more efficient, and increasingly personal.

**Tags:** Tech, Ad, Personalised