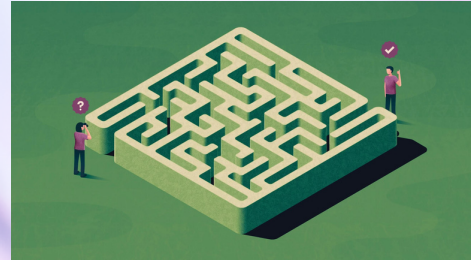




# Byte Quest



**PRIVACY PIONEER: NYM TECHNOLOGIES**



**SECURING SECRETS: ZERO-KNOWLEDGE PROOFS**



**SCENT AND METABOLISM**



**ML TACKLES TIPPING**

## Department Vision

*To be a center for academic excellence in the field of Computer Science and Engineering education to enable graduates to be ethical and competent professionals.*

### **FACULTY COORDINATORS**

**DR. BHARGAVI PEDDIREDDY**  
(ASSOCIATE PROFESSOR)  
**S. KOMAL KAUR**  
(ASST. PROFESSOR)

## Department Mission

*To enable students to develop logic and problem solving approach that will help build their careers in the innovative field of computing and provide creative solutions for the benefit of society.*

### **STUDENT COORDINATORS**

**VAMSI (3/4) CSE C**  
**SPOORTHI (3/4) CSE C**





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## PRIVACY PIONEER: NYM TECHNOLOGIES

Computer scientist Harry Halpin has pioneered an innovative solution to enhance internet privacy, founding Nym Technologies in 2018. Recognizing the inadequacies of current privacy measures, Halpin's approach involves creating an "overlay network" that utilizes existing internet infrastructure while introducing features like traffic rerouting for increased anonymity.



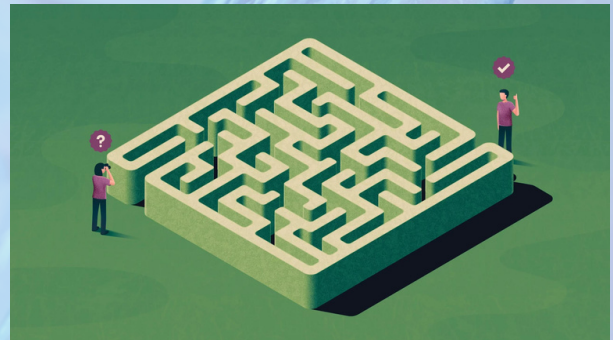
Nym employs a mixnet, an improved version of a 1979 concept, breaking down and encrypting messages for enhanced privacy through multi-node mixing.

A unique aspect is the use of a cryptocurrency-based incentive system, rewarding users operating mixnodes with cryptocurrency to sustain the network. Halpin envisions widespread adoption of Nym's network, emphasizing privacy as a fundamental right despite potential misuse concerns. The system, tested since its 2019 launch with around 500 mixnodes, could handle a significant portion of global internet traffic, providing enhanced privacy for everyday users. Halpin asserts that the societal benefits of privacy outweigh potential risks, positioning it as a cornerstone of freedom.

## SECURING SECRETS: ZERO-KNOWLEDGE PROOFS

Zero-knowledge proofs, developed over 30 years ago, enable proving knowledge without disclosing it. Originating from interactive proofs, they ensure verifying a statement's truth without revealing the associated information.

Pioneered with considerations for poker, these proofs evolved to reveal nothing about the knowledge itself.



In practical terms, zero-knowledge proofs found application in diverse areas such as cryptocurrency transactions and nuclear disarmament. They allow quick and efficient verification without exposing sensitive details. Ongoing research ensures their resilience, particularly with emerging technologies like quantum computing. As technology advances, the cryptographic community remains vigilant in enhancing the security of zero-knowledge proof systems.





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## SCENT AND METABOLISM

Researchers, led by olfactory neuroscientist Alex Wiltschko, have used machine learning to enhance our understanding of olfaction, uncovering a hidden order in the relationship between scent perception and the structure of aromatic molecules.



Traditionally, predicting the smell of a molecule has been challenging, with the complexity of human olfactory receptors complicating the process. The team's novel approach involved incorporating metabolic information into their calculations, considering the chemical reactions catalyzed by enzymes in cellular metabolism. They created a map of metabolic relationships, finding that molecules closer on this map tended to smell more similar, even if structurally different. The findings suggest a biological basis for scent perception, linking metabolic processes to olfactory experiences. While the model is not perfect, it represents a significant improvement over previous attempts based solely on chemical structure. The research opens new avenues for understanding how our sense of smell is intricately connected to the natural world's chemical processes, offering insights into the complexities of odor perception.





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## ML TACKLES TIPPING

In recent breakthroughs, researchers, led by chaos expert Edward Ott at the University of Maryland, have harnessed machine learning to predict tipping points in complex systems.



Traditionally challenging due to abrupt, potentially irreversible shifts, these transitions are crucial in fields like climate science. The study, building on Ott's 2018 findings, utilized reservoir computing, a less computationally expensive method, to predict tipping points in nonstationary systems, even when trained on noisy data. Surprisingly, the algorithm performed best with noise, offering a broader understanding of system behavior. The researchers also tackled hysteretic transitions, where systems enter uncharted territories, combining machine learning with conventional models to enhance predictive accuracy. This work holds promise for applications in climate science, ecology, epidemiology, and beyond, offering a unique approach to understanding and foreseeing critical shifts in diverse systems.

These findings mark a significant step forward, presenting a novel avenue for studying and addressing tipping points in dynamic systems effectively.

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