

## Sergiy Popovych 博士演講：

### A Cross-Cultural Journey: From NCTU to Princeton, and From Academy to AI NeuroScience Startup

文／羅時弘 資科工碩士生



來自烏克蘭的 Sergiy Popovych 博士於 2014 年在國立交通大學資訊工程學系取得學士學位，隨後在普林斯頓大學 (Princeton University) 取得碩士與博士學位。Popovych 博士曾於在學期間開設新創公司並獲得普林斯頓大學校園新創加速器 YCombinator 1100 萬美元的投資，目前在神經科學研究新創公司 Zetta AI 單任首席技術長 (CTO)。

Popovych 博士於 2024 年 6 月 24 日回到母校演講，分享他從在台灣學習資訊工程到在美國領到一間計算神經科學新創公司的心路歷程，以及在普林斯頓大學開發大規模計算機視覺應用程式的經歷是如何幫助他在就讀博士期間獲得新創投資，並討論在現今競爭激烈的環境中籌集風險投資所會面臨的挑戰和他取得的成功。此外，Popovych 博士介紹了目前他擔任 Zetta AI 技術長的情況，探討他和他的團隊是如何利用人工智慧分析腦組織的數據，分享最新、最尖端的人工智慧應用，以及再將這些技術應用於人類大腦分析之前需要解決的問題與挑戰。

演講的上半部分，Popovych 博士分享他的求學經歷。原先在交大時參與 EDA 領域的研究，但到普林斯頓大學後加入研究編譯器的實驗室，爾後指導教授更換研究領域，而 Popovych 博士最後因他在學習編譯器期間鍛鍊出的傑出軟體開發能力受其他教授賞識，轉往研究 AI 領域的

實驗室。在就學期間，他與其他同學合作開創 Actueloop 提供 GPU 等計算租賃服務，第一次 demo 時就獲得 100 萬美元的投資，很可惜的是由於簽證環境改變以及對共同投資人的選擇有歧異最後並沒有成功。Popovych 博士提到台美兩地的差異：在美國，新創風氣盛行，幾乎每個學生都想要且勇於募資開展事業，甚至許多人都沒有明確的提案也能募得資金，雖然學生非常有自信，但以工程能力上來說台灣學生並不下風甚至更好，他不理解台灣為何有數量多且優秀的工程人才卻沒有大規模的新創產業，認為可能是籌募資金不便或者文化上的差異。

演講的後半提到博士目前在 Zetta AI 以人工智慧技術推進腦神經科學的研究。腦神經組織結構複雜，Popovych 博士和他的團隊利用 AI 處理腦組織切片的多張 2D 電子顯微鏡影像，重建出組織中每個神經元的 3D 構造和與其他神經元的突觸連結。其中所遇到的挑戰有：腦組織在切片的過程中會有抖動且可能會破裂或折疊，使得前後兩張影像的差異甚大；還有訓練 AI 所需的資料缺少 ground truth。Zetta AI 結合光流法 (optic flow) 等傳統影像處理以及自監督學習 (self-supervised learning) 解決這些問題，Popovych 博士認為結合 AI 與傳統方法是比分別純粹使用兩者還要更加務實且可行的模式。

Popovych 博士從資金來源分析為何利用 AI 進行神經科學研究十分重要。Zetta AI 目前主要的投資者是美國政府部門，包含國家衛生院 (NIH) 及情報高等研究計畫署 (IARPA)。對於 NIH 來說，如果想要推進對於精神疾病等健康研究，對於人類腦神經系統的了解必不可少，而這些研究又需要一項高效的工具分析腦組織，正如同人類基因組計畫利用電腦及演算法加速基因定序一樣，AI 技術也能加速研究流程。而在目前 AI 議題熱門，各國爭相推進 AI 研究的背景下，各國政府也將開發 AI 技術視為重點，因此 IARPA 投資許多 AI 新創產業以建議相關的技術儲備。

## Speech by Dr. Sergiy Popovych

### A Cross-Cultural Journey: From NCTU to Princeton, and From Academy to AI NeuroScience Startup

Dr. Sergiy Popovych, originally from Ukraine, obtained his bachelor's degree in Computer Science from National Chiao Tung University in 2014. He then pursued and completed both his master's and doctoral degrees at Princeton University. Throughout his academic journey, Dr. Popovych established a startup that successfully secured \$11 million in investment from Y Combinator, Princeton University startup accelerator. He is currently serving as the Chief Technology Officer (CTO) at Zetta AI, a company dedicated to neuroscience research.

On June 24, 2024, Dr. Popovych revisited his alma mater to deliver a speech. He recounted his journey from studying computer science in Taiwan to leading a computational neuroscience startup in the United States. Dr. Popovych detailed how his work on large-scale computer vision applications at Princeton University played a crucial role in securing startup investment during his doctoral studies. He also discussed the challenges of raising venture capital in today's competitive landscape and highlighted his successes in this area. Additionally, he introduced his current role as Chief Technology Officer at Zetta AI, explaining how he and his team leverage artificial intelligence to analyze brain tissue data. Dr. Popovych also shared insights into the latest advancements in AI, as well as the challenges that need to be addressed before these technologies can be effectively applied to human brain analysis.

In the first half of his speech, Dr. Popovych shared his educational journey, which began with EDA research at National Chiao Tung University. He then transitioned to a compiler research lab at Princeton University. When his advisor shifted research focus, Dr. Popovych's exceptional software development skills, honed through his work on compilers, attracted the attention of other professors and led him to a lab focused on AI research. During his studies, he and his classmates co-founded Actueloop, a company offering GPU and other computing rental services. Their initial demo secured a \$1 million investment; however, the venture ultimately failed due to changes in visa regulations and disagreements with co-investors. Dr. Popovych compared the entrepreneurial environments of Taiwan and the U.S., noting that in America, the startup scene is dynamic, with nearly every student eager to raise funds and launch ventures, often without a well-defined proposal. While Taiwanese students demonstrate great confidence and are equally, if not more, skilled in engineering, he expressed confusion about why Taiwan, despite its abundance of talented engineers, lacks a robust startup industry. He speculated that challenges with

fundraising or cultural differences might be to blame.

Dr. Popovych discussed his current research at Zetta AI, where he is employing artificial intelligence to advance the field of neuroscience, in the second half of his speech. Given the inherent complexity of neural tissue, Dr. Popovych and his team use AI to analyze a series of 2D electron microscopy images of brain tissue slices, reconstructing the 3D architecture of individual neurons and their synaptic connections. They face challenges such as tissue jitter, potential rupturing, or folding during the slicing process, which can cause significant discrepancies between consecutive images, and the lack of ground truth data necessary to train the AI. To address these issues, Zetta AI combines traditional image processing techniques, such as optical flow, with self-supervised learning methods. Dr. Popovych believes that integrating AI with conventional techniques is a more practical and feasible approach than relying on either method alone.

Dr. Popovych emphasized the importance of using AI in neuroscience research, particularly from a funding perspective. Zetta AI's primary investors include U.S. government agencies such as the National Institutes of Health (NIH) and the Intelligence Advanced Research Projects Activity (IARPA). For NIH, advancing research on mental health and other conditions requires a deep understanding of the human brain and nervous system. This research demands effective tools for analyzing brain tissue. Just as the Human Genome Project used computers and algorithms to accelerate gene sequencing, AI technology has the potential to significantly expedite neuroscience research. With AI's growing prominence globally and the push to advance AI technologies, IARPA is making substantial investments in AI startups to build technological capabilities and foster innovation.

