

史丹佛大學 Michael Saunders 教授演講 Algorithms for Constrained Optimization: The Benefits of General-purpose Software

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Michael Saunders 教授為大師級學者，目前為美國頂尖大學史丹佛大學 (Stanford University) Department of Management Science and Engineering (MS&E) Research Professor，在國際學術界具有舉足輕重的地位。他的許多經典理論成果被許多教科書收錄，此外，他參與發展的許多軟體如 MINOS、NPSOL、SNOPT 亦被廣泛使用。他亦為 ISI 高引用學者 (Highly Cited Researcher)，並入選美國史丹佛大學發明名人堂 (Invention Hall of Fame)。同時，Michael Saunders 教授是 SIAM Fellow，他曾獲得多項學術獎項及榮譽，包含：1985 William Orchard-Hays Prize in Computational Mathematical Programming、Mathematical Programming Society (first recipient)、2004 ISI Highly Cited Researcher in Computer Science、2007 ISI Highly Cited Researcher in Mathematics、2007 Honorary Fellowship of the Royal Society of New Zealand、2012 SIAM Linear Algebra Prize (with S.-C. Choi and C. C. Paige)、2012 Stanford University Invention Hall of Fame (with P. E. Gill, W. Murray, B. A. Murtagh, and M. H. Wright)、2013 SIAM Fellow (For contributions to numerical optimization, linear algebra, and software) 等。Michael Saunders 教授是資訊與數學領域國際公認的頂尖研究學者，他在 numerical optimization、numerical linear

algebra、sparse-matrix methods 與 portable software 的研究領域方面有卓越的貢獻，居世界重要領導地位。

本系陳志成院長於 2023 年 8 月邀請到 Michael Saunders 教授來台進行學術交流及專題演講。Michael Saunders 教授在 8 月 26 日上午與同學們的座談中，介紹了他在數值方法、電腦科學領域的研究與經驗，並且與陽明交大師生相互討論各自的研究主題，有益於雙邊之交流。接著，在下午的專題演講中，Michael Saunders 教授對解決約束最佳化問題的演算法進行演講，並且介紹用於解決該類問題之通用軟體。在演講中，Michael Saunders 教授簡要說明了最佳化問題中線性規劃的基本形式，並且展示了他發展的許多最佳化軟體的應用歷史。其中以飛行器為例，最佳化方法能夠用於解決飛行器的路徑及形狀的最佳化，藉此能夠達到最佳效率。最後，Michael Saunders 教授介紹了他的研究領域的未來發展，例如時下非常熱門的 AI 人工智慧正是旨在解決最佳化問題。

本次座談與演講 Michael Saunders 教授帶領我們探索最佳化方法的發展及其應用。從中我們可以理解到，數值最佳化方法能夠幫助我們解決實際的工程問題。這次的座談與演講也能夠啟發我們，透過最佳化方法來解決研究議題，以達成更好的效率，對於我們未來的研究助益良多。

Michael Saunders, Stanford University, “Algorithms for Constrained Optimization: The Benefits of General-purpose Software”

Professor Michael Saunders is a highly accomplished scholar currently serving as a Professor (Research) Emeritus in the Department of Management Science and Engineering (MS&E) at the prestigious Stanford University in the United States. He holds a prominent position within the global academic community, and his classic theoretical accomplishments are featured in numerous textbooks. Additionally, the software projects he has contributed to, such as MINOS, NPSOL, and SNOPT, are widely used. He is also recognized as a Highly Cited Researcher by ISI and has been inducted into the Invention Hall of Fame at Stanford University in the United States. Simultaneously, Professor Michael Saunders is a SIAM Fellow. His many honors include 1985 William Orchard-Hays Prize in Computational Mathematical Programming awarded by the Mathematical Programming Society (making him the first recipient), 2004 ISI Highly Cited Researcher in Computer Science, 2007 ISI Highly Cited Researcher in Mathematics, 2007 Honorary Fellowship of the Royal Society of New Zealand, 2012 SIAM Linear Algebra Prize (shared with S.-C. Choi and C. C. Paige), 2012 induction into the Stanford University Invention Hall of Fame (with P. E. Gill, W. Murray, B. A. Murtagh, and M. H. Wright), and 2013 SIAM Fellow (acknowledging his contributions to numerical optimization, linear algebra, and software), etc. Professor Saunders is a prominent research scholar in the fields of Computer Science and mathematics, both nationally and internationally. He has made a significant impact on numerical optimization, numerical linear algebra, sparse-matrix methods, and portable software, and holds a crucial leadership position in the world.

Dr. Jyh-Cheng Chen, the Dean of the College of Computer Science (CCS), invites Professor Michael

Saunders for an academic exchange and a special lecture in Taiwan in August 2023. During a dialogue session with students on the morning of August 26th, Professor Saunders shared his research and expertise in numerical methods and computer science. The exchange between Professor Saunders, as well as students and faculty from Yang Ming Chiao Tung University, where they delved into their respective research topics, proved advantageous for mutual knowledge sharing. Afterward, during the afternoon speech, Professor Saunders discussed algorithms designed to tackle constrained optimization problems and introduced general-purpose software used to resolve such issues. Throughout the presentation, he provided a brief overview of the fundamental structure of linear programming within optimization problems and presented the application history of several optimization software programs he has developed. Using the example of aircraft, optimization techniques can be applied to address challenges related to the aircraft's path and configuration, ultimately achieving optimal efficiency. In conclusion, Professor Michael Saunders delved into prospective advancements in his research domain, emphasizing the current widespread interest in Artificial Intelligence aimed at addressing optimization problems.

In this discussion and lecture, Professor Michael Saunders guides us in exploring the development and application of optimization methods, revealing that numerical optimization methods can effectively address real-world engineering challenges. Furthermore, this event serves as inspiration, motivating us to apply optimization methods to address research issues, ultimately improving efficiency and contributing to the advancement of our future research.

