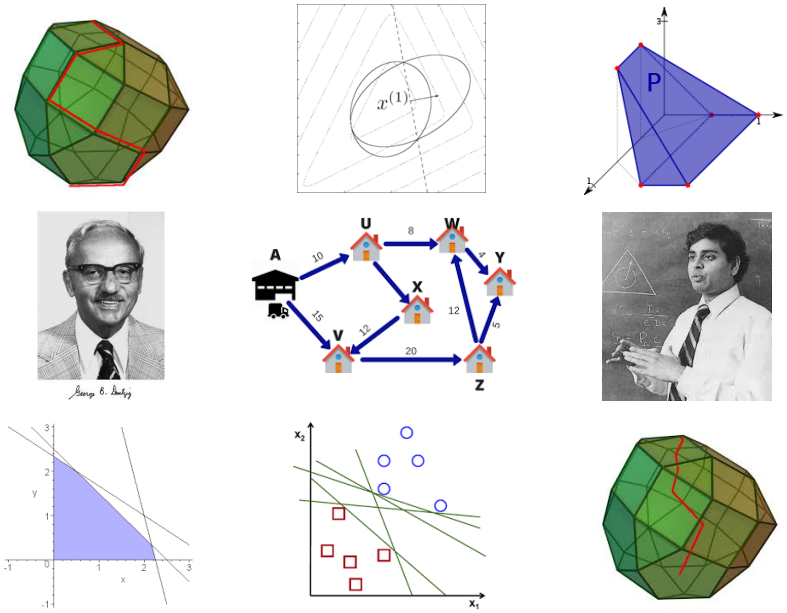
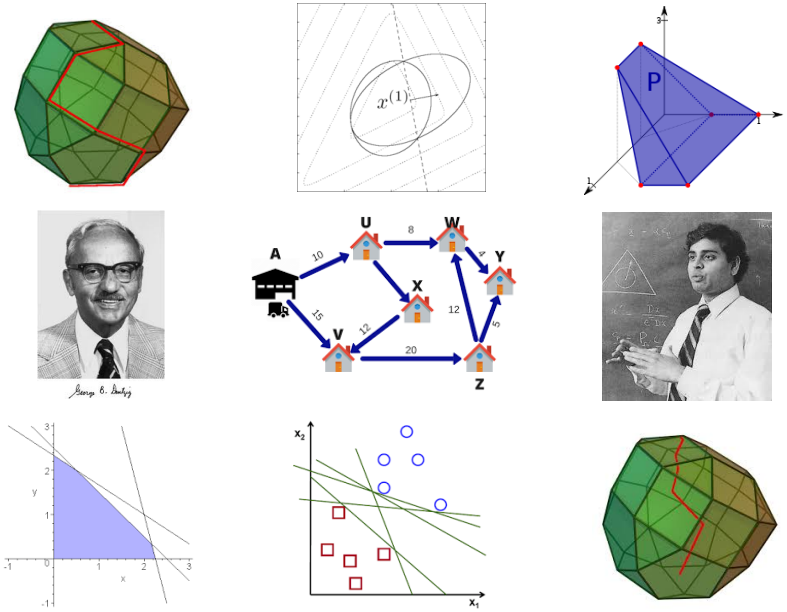


Lineárne programovanie
zimný semester 2019/20

M. Trnovská, KAMŠ, FMFI UK



Úvod do lineárneho programovania (3)

História lineárneho programovania

História lineárneho programovania

- 1826 - **J.B.J. Fourier**
práce obsahujú myšlienku simplexovej metódy pre 3-rozmerné úlohy

- 19.-20. st. - **G. Farkas**
"Über die theorie der Einfachen Ungleichungen" (Journal für die Reine und Angewandte Mathematik 124)

- 30. roky 20. st. - vznikajú práce týkajúce sa špeciálnych úloh LP založené na kombinatorických úvahách (König, Egerváry)

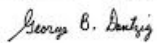
História lineárneho programovania

- 1939 - **L. V. Kantorovič**

základy teórie LP - "Matematické metódy organizácie a plánovania produkcie", 1975 - Nobelova cena za ekonómiu - spolu s T. Koopmansom

- 1947 - **G.B. Dantzig**

- všeobecná formulácia LP a simplexovej metódy (primárny simplexový algoritmus)



História lineárneho programovania

Pôvodná CIA zložka o Kantorovičovi

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USSR

Leonid Vital'yevich KANTOROVICH

Head, Problems Laboratory of Economic-Mathematical Methods and Operations Research, Institute of Management of the National Economy

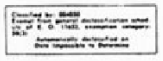
(1975)

An internationally recognized creative genius in the fields of mathematics and the application of electronic computers to economic affairs, Academician Leonid Kantorovich (pronounced kahntuhROHvich) has worked at the Institute of Management of the National Economy since 1971. He has been involved in advanced mathematical research since the age of 15; in 1939 he invented linear programming, one of the most significant contributions to economic management in the twentieth century. Kantorovich has spent most of his adult life battling to win acceptance for his revolutionary concept from Soviet academic and economic bureaucracies; the value of linear programming to Soviet economic practices was not really recognized by his country's authorities until 1965, when Kantorovich was awarded a Lenin Prize for his work. International recognition came in October 1975, when the mathematician was awarded the Nobel Prize for Economics jointly with T. C. Koopmans, a Dutch-born American economist who discovered the same concept independently a few years after Kantorovich.

In addition to his mathematical research, Kantorovich has been directly involved in developing improved designs for high-speed digital computers, an activity apparently motivated by the Soviet Union's need for improved computers in solving large economic planning problems.

The Institute of Management of the National Economy

The Institute of Management of the National Economy was established to train high-level economic and industrial administrators in modern methods of management, production organization and the use of economic-mathematical methods and computers in planning. When the institute opened in early 1971, Premier Aleksey Kosygin and Party Secretary Andrey Kirilenko attended the ceremonies, thus suggesting the importance that the Soviet Government and Party attach to the application of modern management techniques to Soviet industrial administration and economic planning.



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História lineárneho programovania

• 1947 - J. Laderman - prvé seriózne použitie simplexovej metódy na "large-scale" úlohe (9 ohraničení, 77 premenných) použili sa manuálne kalkulačky, 9 operátroiek, nájdenie optima trvalo 14 dní

Human Computers 1947
NASA Langley Research Center 1/28/1947 Image # EL-2001-00471

História lineárneho programovania

- 24.6.1948 - blokáda Berlína Sovietskou armádou, západné mocnosti potrebovali zásobiť vyše 2 mil. obyvateľov max. množstvom tovaru (potraviny, oblečenie a i.)
Planning Research Division of the U.S. Air Force - zamestnanci riešili "large-scale" úlohu s vyše 50 premennými (počet lietadiel, kapacita posádky, financie,...)

História lineárneho programovania

• 1953-54 - ďalšie **varianty simplexovej metódy:** duálna simplexová metóda (C. E. Lemke), revidovaná simplexová metóda (G. B. Dantzig, W. O. Hays)

• 1954 - **W. Orchard-Hays** - prvý komerčný kód pre LP, implementovaný do IBM CPC

• 60. roky - LP algoritmy komerčne dostupné, využívané najmä ropnými spoločnosťami

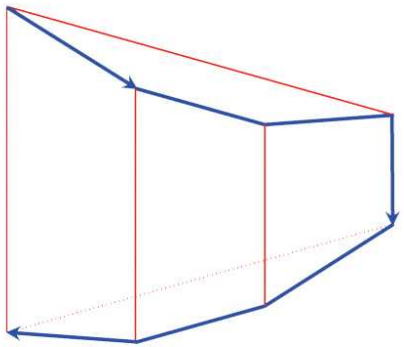
História lineárneho programovania

By Seattle Municipal Archives - Flickr: City Light worker with office machine, 1954, CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=25282004

História lineárneho programovania

- 60.-70. roky - vznik nového vedného odboru - **výpočtová zložitosť**: "efektívny program musí byť polynomiálny"

- 1972 - **Klee, Minty** - simplexová metóda nemusí byť časovo polynomiálna



Klee-Mintyho kocka

História lineárneho programovania

• 1979 - **L. Khachian** - Elipsoidová metóda - prvý polynomiálny algoritmus na riešenie úloh lineárneho programovania (založený na metódach nelineárnej optimalizácie, v praxi neefektívny)

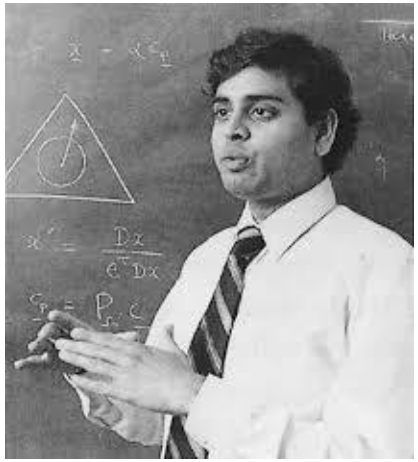
• 1984 - **N. Karmarkar** - projektívny algoritmus - polynomiálny aj efektívny v praxi

• 1985 - **AT&T Bell Labs** - požiadali o získanie patentu na Karmarkarov algoritmus

• 1986 - **P. Gill** - súvislosť Karmarkarovej projektívnej metódy s logaritmickou bariérovou metódou vnútorného bodu zo 60. rokov pre nelineárne úlohy

História lineárneho programovania

- 1988 - patent udelený pod číslom US4744028A s názvom "Methods and apparatus for efficient resource allocation"



Narendra Karmarkar, 1984