AI for Social Good

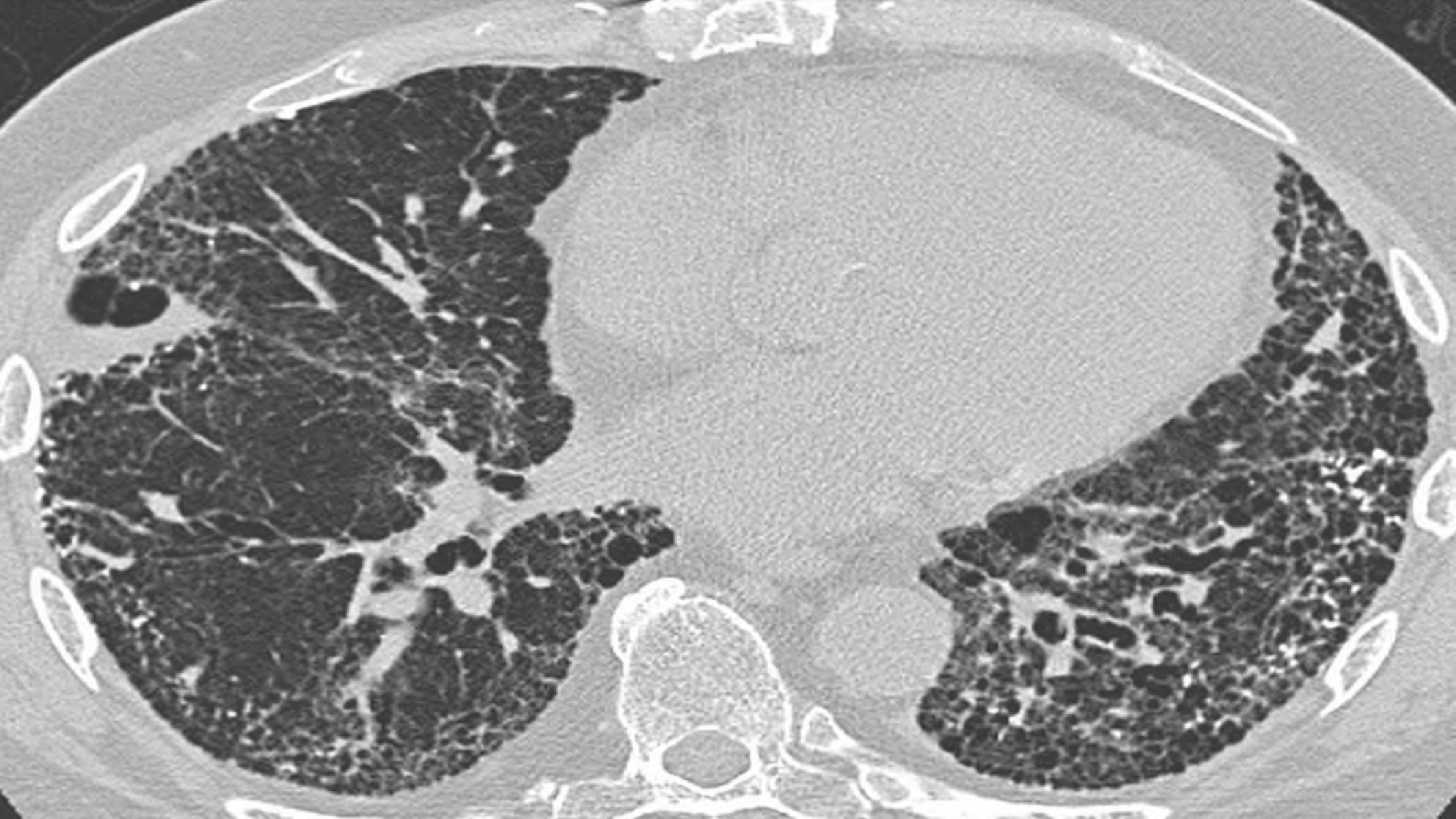
人工智能造福人类的那一面

Prof. Toby Walsh
UNSW Sydney | Data61 | TU Berlin
澳大利亚新南威尔士大学教授、AAAI执行委员会成员

浙江省体育局

柯洁 KE JIE
00:51:45

ALPHAGO
02:10:43




09:41
babylon
First things first. Have you recently injured your head, (including a burn or a bite)?
No
Today 14:16
Right, do you have any pain?
Yes, a general headache
Sorry to hear that. How did it start?
Today 14:16
Gradually
How bad is your pain?
Moderate (interfering with normal activities)
Today 14:17
I see. Do you have any dizziness?
No
Yes, it began suddenly
Yes, it began gradually


Baidu USA
Speak Now
Cancel
English

theguardian

Japanese company replaces office workers with artificial intelligence

Insurance firm Fukoku Mutual Life Insurance is making 34 employees redundant and replacing them with IBM's Watson Explorer AI


Expedia.cn
首页
酒店
预订您的酒店
全球 27 万多家酒店
前往
目的地、机场、火车站、地标或具体地址
入住：
年/月/日
退房：
年/月/日
房间数量
1
成人 (18+)
2
搜索

Centre on Impact of AI and Robotics

Exploring the future of AI and Robotics. Informing the debate. Helping to ensure beneficial outcomes for all.

EDUCATION:
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OCCASIONAL PAPER SERIES

The AI Revolution

TOBY WALSH | PROFESSOR OF ARTIFICIAL INTELLIGENCE


AI for GOOD GLOBAL SUMMIT
Hosted at ITU in Geneva
7-9 June 2017
#AIforGood
AI
XPRIZE
ITU
Artificial Intelligence will change the way we shape our world.


Please
donate
food

Poverty

23 million people in Australia

2.2 million in poverty

- 11% children
- 25% pensioners
- **Over 100,000 homeless**

FoodBank Local

Social startup

Winners of Microsoft Imagine Cup (Australia)

Finalists worldwide

Using technology

To reduce friction for FoodBank Australia (and other NGOs)

Collecting & distributing food

Fair division

To different charities

Pickup & delivery problem

Induced traveling salesperson problem

Online fair divison

Goods arrive one by one

Agents see items and bid

Only 0/1 utilities

Special features

Online

Repeated

Combinatorial

Storage

Expiry dates

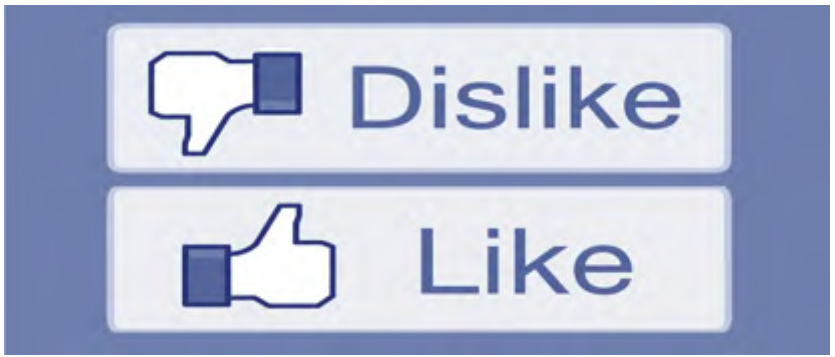
Unequal entitlements

…

Like mechanism

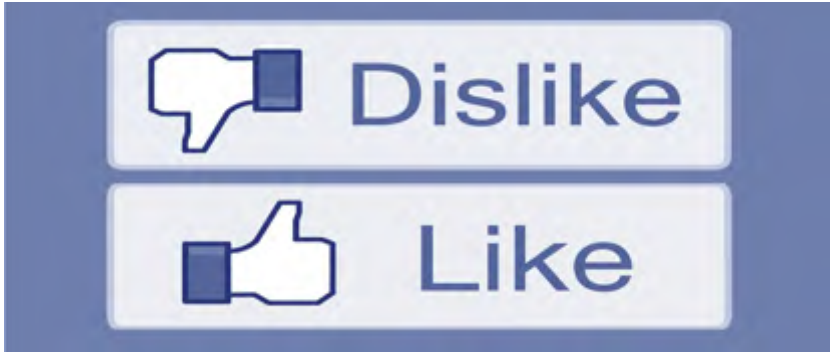
Agents bid for any item with non-zero utility

Item allocated uniformly at random to any bidder



Balanced Like mechanism

Agents bid for any item with non-zero utility



Item allocated uniformly at random to bidder with fewest items

Normative properties

THM

Like is strategy proof.

THM

Balanced Like is strategy proof for 2 agents but not for 3.

Normative properties

THM

Both Like and Balanced Like are envy free ex ante

THM

Balanced Like is envy free up to one item ex post.


HUMAN
ORGAN
FOR TRANSPLANT

Deceased organ donation

In 1989, average organ was 32 years old.

In 2014, average organ was 46 years old.

Fair division of organs

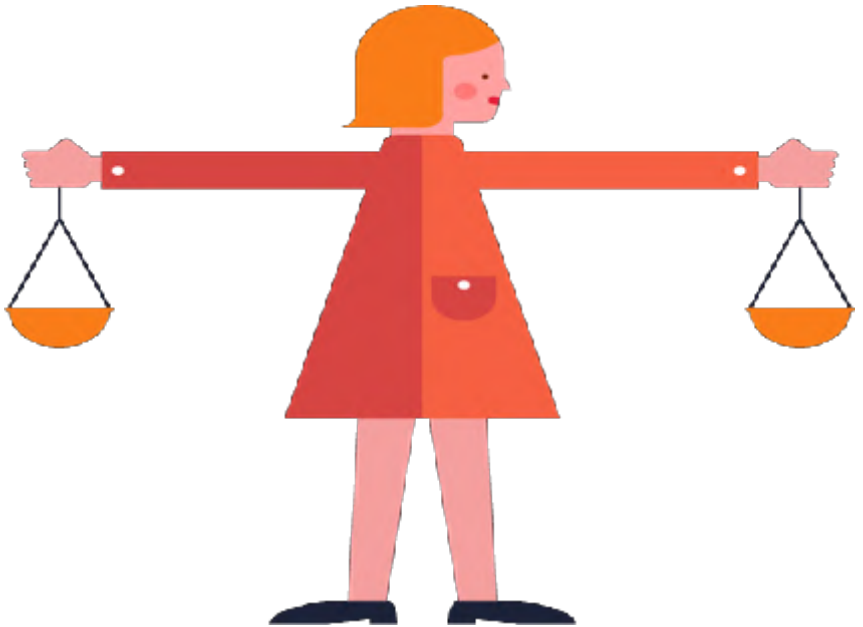
Online

Blood types

Age groups

Geographical regions

…



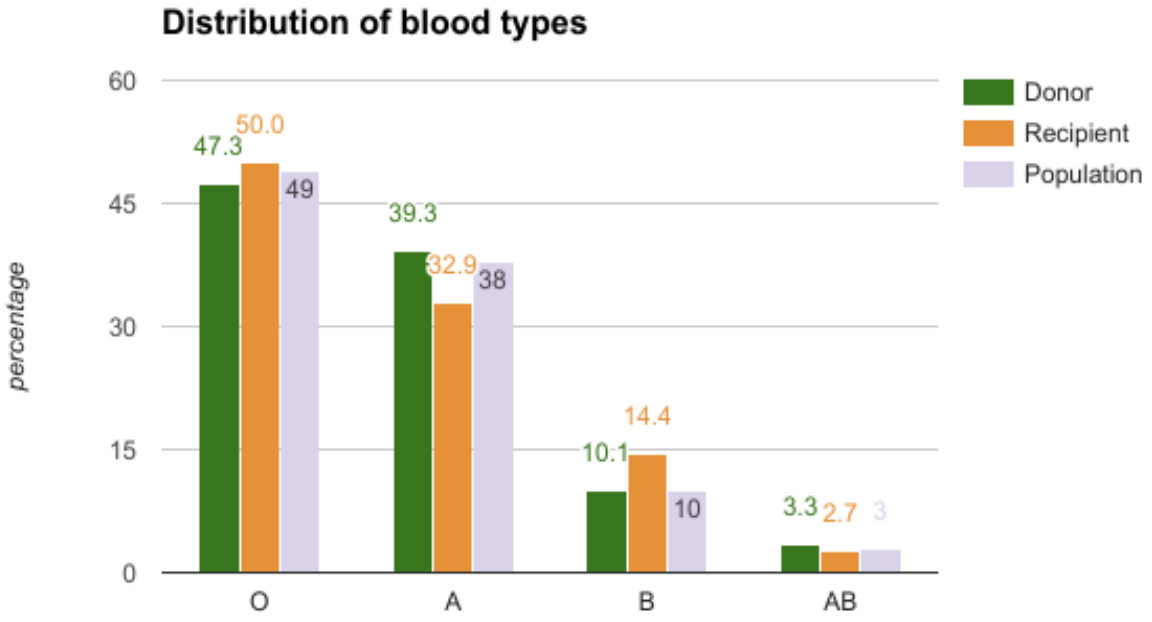
Blood types

Supply tracks population

Demand different

Blood type B at disadvantage

No help that O are universal donors



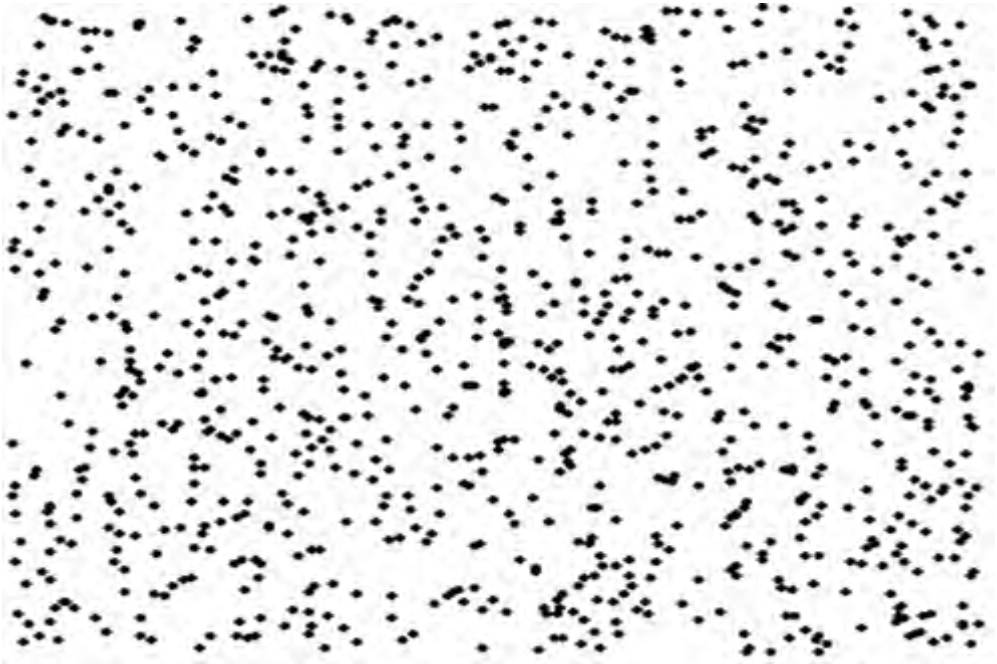
Organ & patient quality

Kidney Donor Profile Index (KDPI)

age of donor, …

Expected Post Transplant Survival (EPTS)

age of patient, …



BOX mechanism

Lexicographical preferences

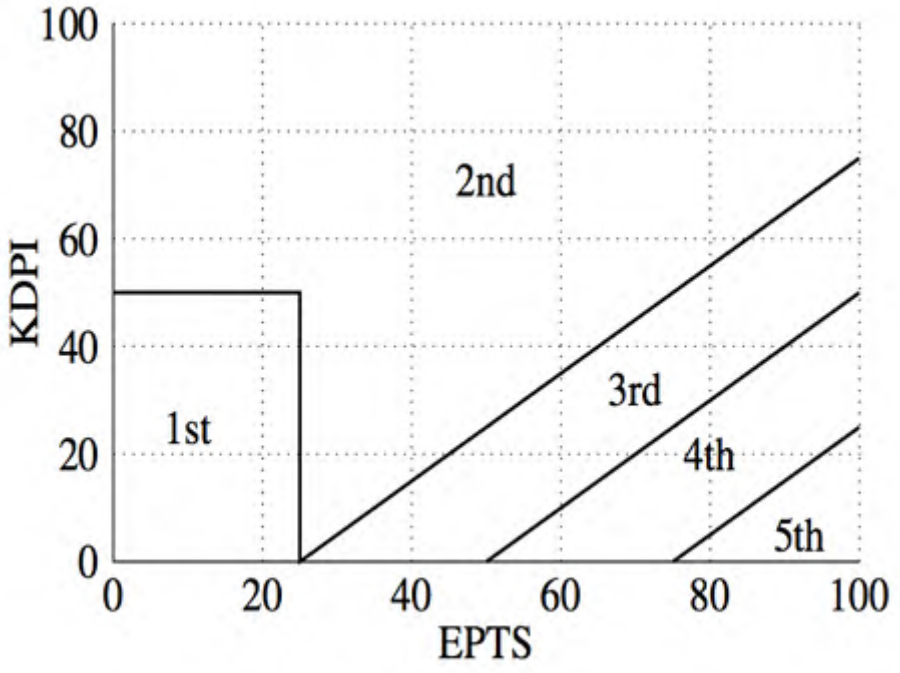
- **Blood/tissue type**
- **KDPI and EPTS**
- **Time on waiting list, …**

If KDPI>max then 0, exit
If KDPI<=50 and EPTS<=25 then +4000000
If KDPI>EPTS-50 then +3000000, goto 2
If EPTS-50<=KDPI<=EPTS-25 then +200000, goto 2
If EPTS-75<=KDPI<=EPTS-50 then +100000, goto 2
…

BOX mechanism

Lexicographical preferences

- **Blood/tissue type**
- **KDPI and EPTS**
- **Time on waiting list, …**



BOX mechanism

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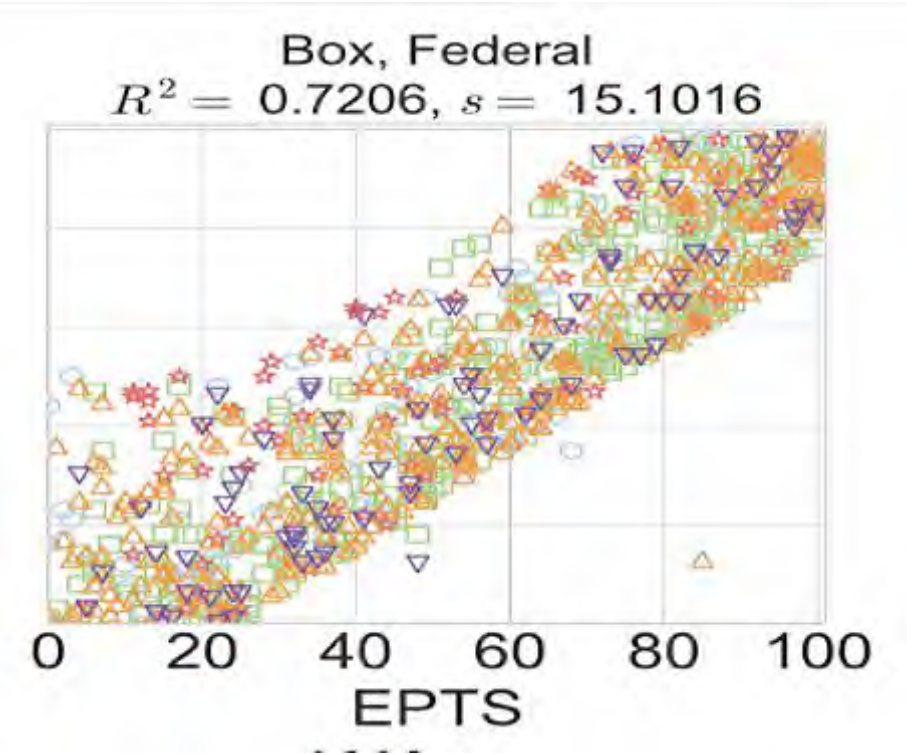
- **Time on waiting list, …**

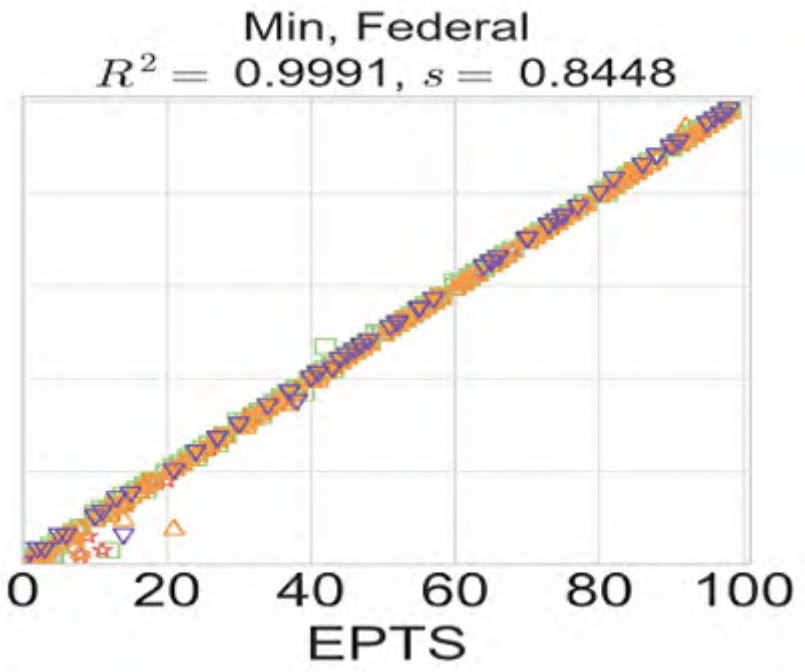


MIN mechanism

Amongst compatible blood/tissue type

minimize |KDPI-EPTS|

tie break by time on waiting list, …

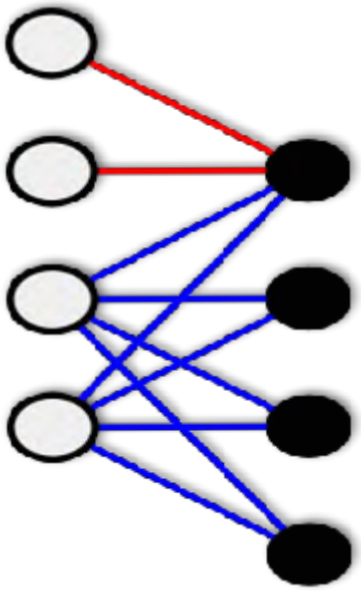


Why MIN?

This is two-sided matching with identical preferences

Patient wants organ with smallest KDPI

Organ wants patient with smallest EPTS

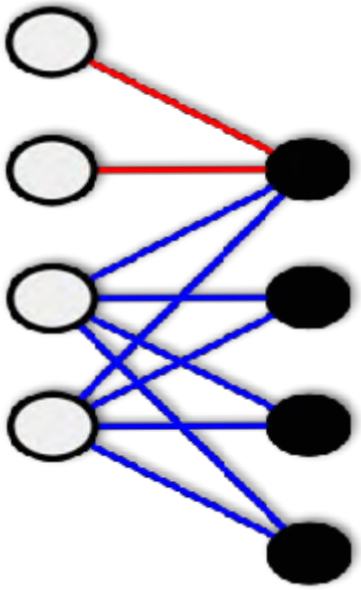


Stable organ matching

Two-sided matching with identical preferences

Unique stable matching

ith ranked patient with ith ranked organ

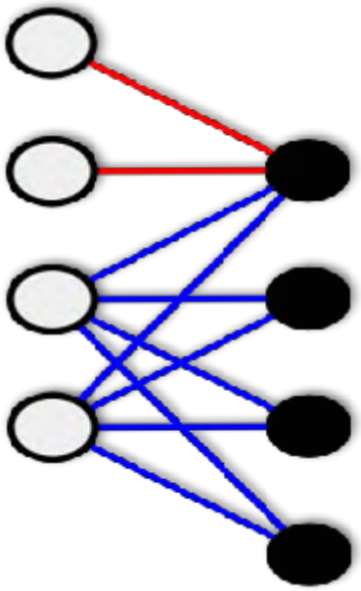


MIN = stable matching

Two-sided matching with identical preferences

Unique stable matching

ith ranked patient with ith ranked organ



But online so what is ranking?

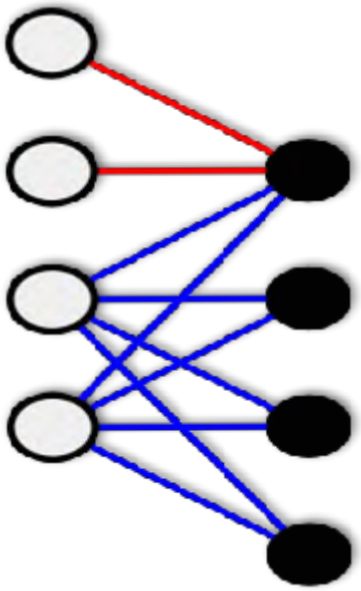
MIN = stable matching

Two-sided matching with identical preferences

Unique stable matching

Matching with |EPTS-KDPI| minimized

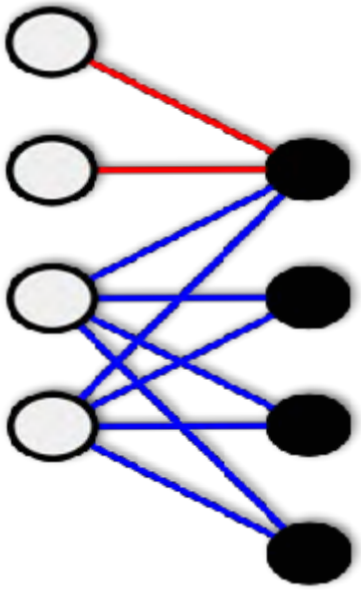
Suppose each is population percentile (which they are!)



Formal model

At each time step

- **some patients arrive OR**
- **some patients depart OR**
- **some organs arrive**

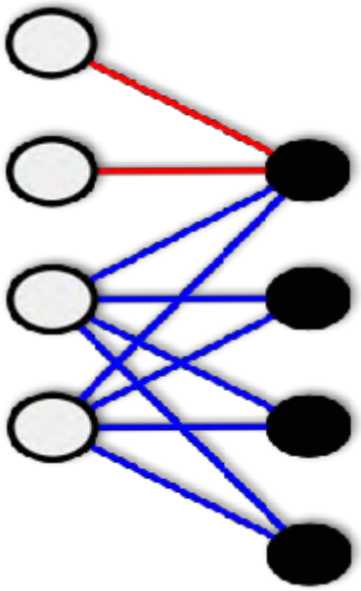


Formal model

Organs are matched on arrival

each organ has KDPI

each patient has EPTS



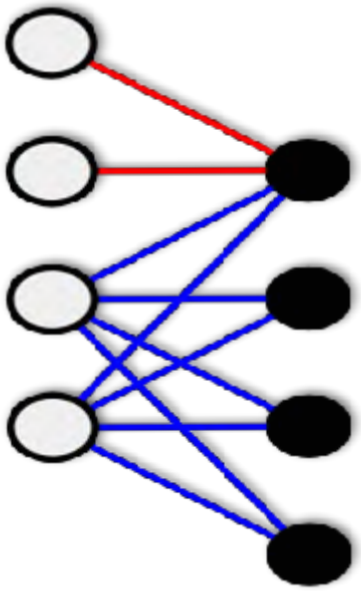
Normative properties

THM

MIN is organ monotonic

THM

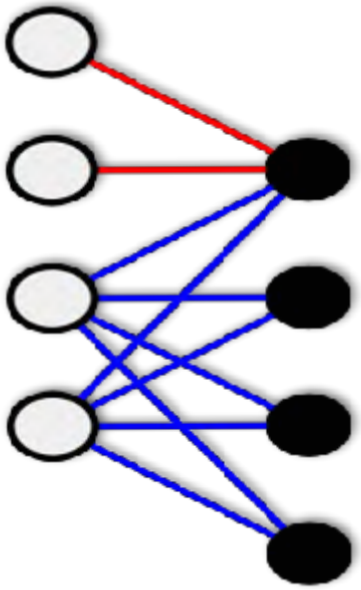
MIN is patient monotonic



Normative properties

THM

No mechanism satisfies participation



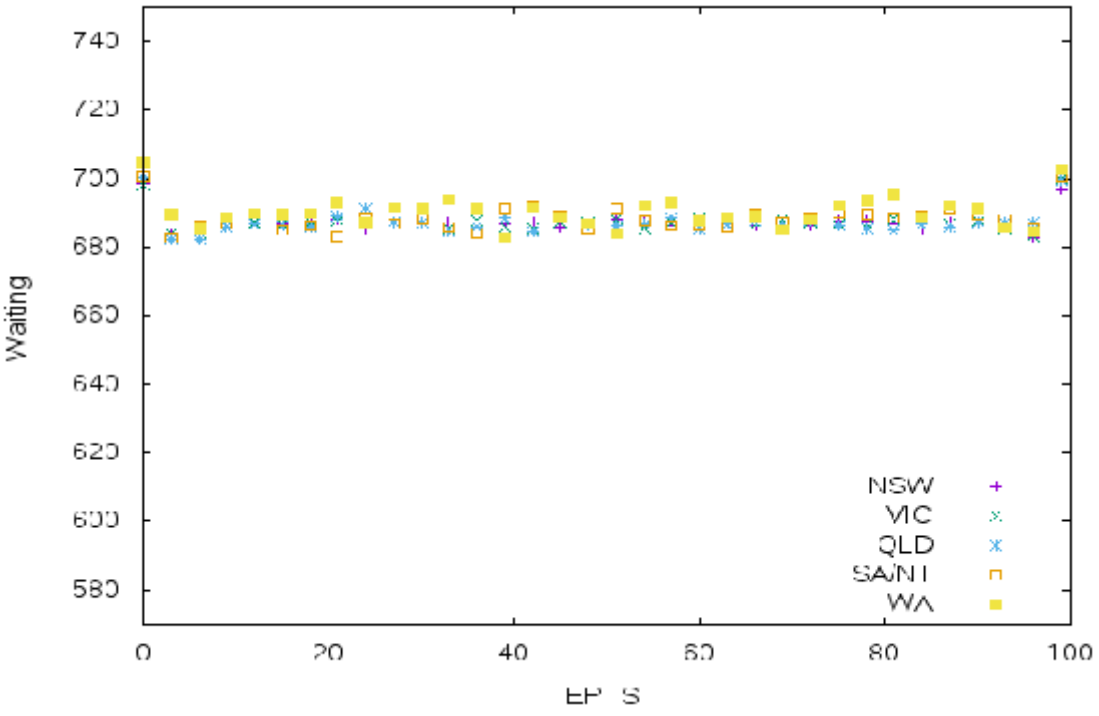
THM

Only strategy proof mechanisms are random

Waiting time

Total waiting time constant

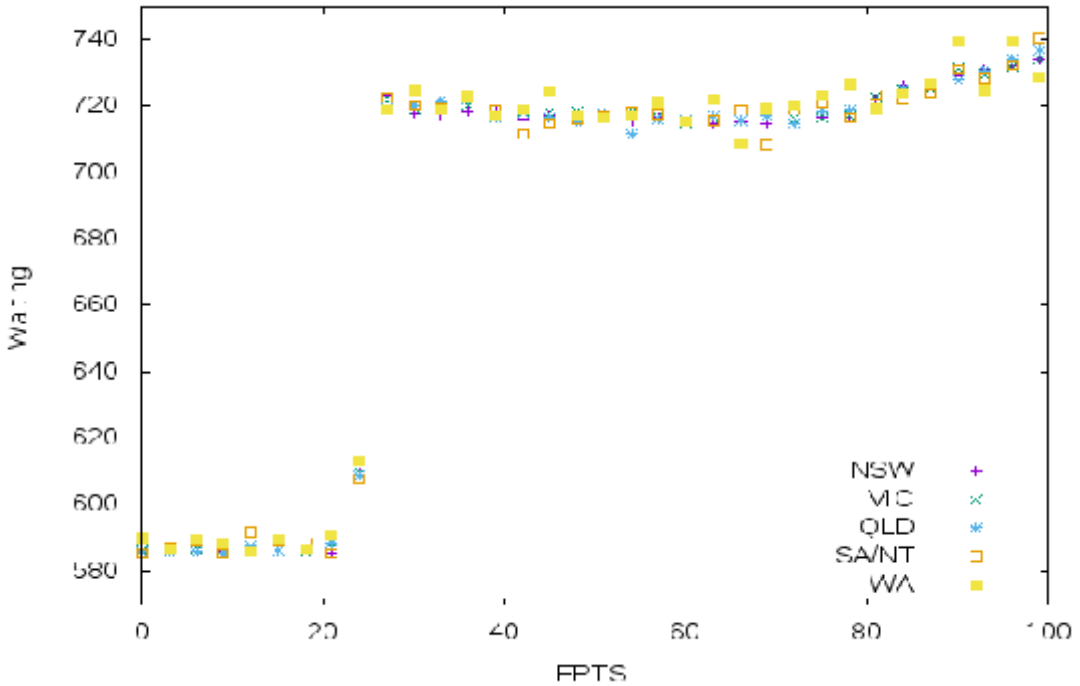
MIN distributes this evenly



Waiting time

Total waiting time constant

BOX does not



From food to organ banks

Both *online* fair division problems

Special features we can exploit (like identical preferences)

Normative analysis useful

Tradeoff between fairness & efficiency

From food to organ banks

Join me (& others) in doing AI for social good

- **Computational sustainability**
- **Security games**
- **AI & Education**
- **AI & Health**
- **…**

For more on "AI for Social Good"

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