

Proving the Incompatibility of Efficiency and Strategyproofness via SMT Solving

IJCAI 2016

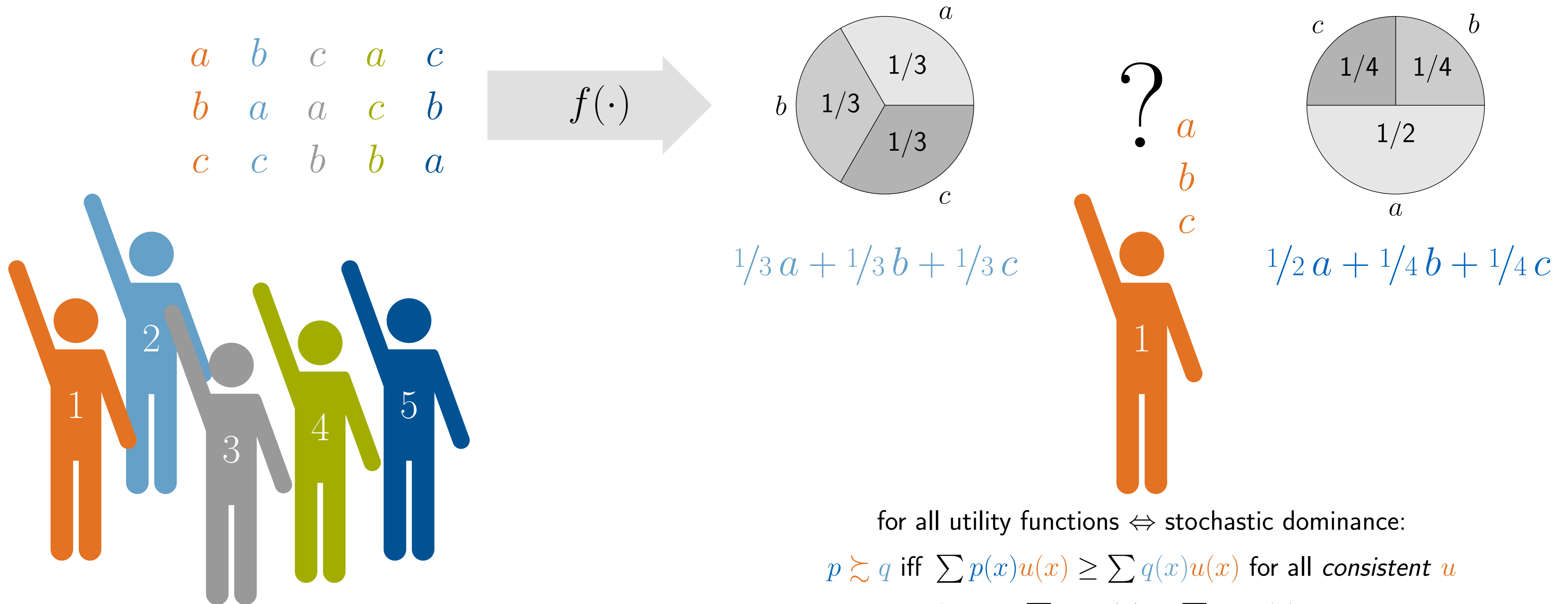
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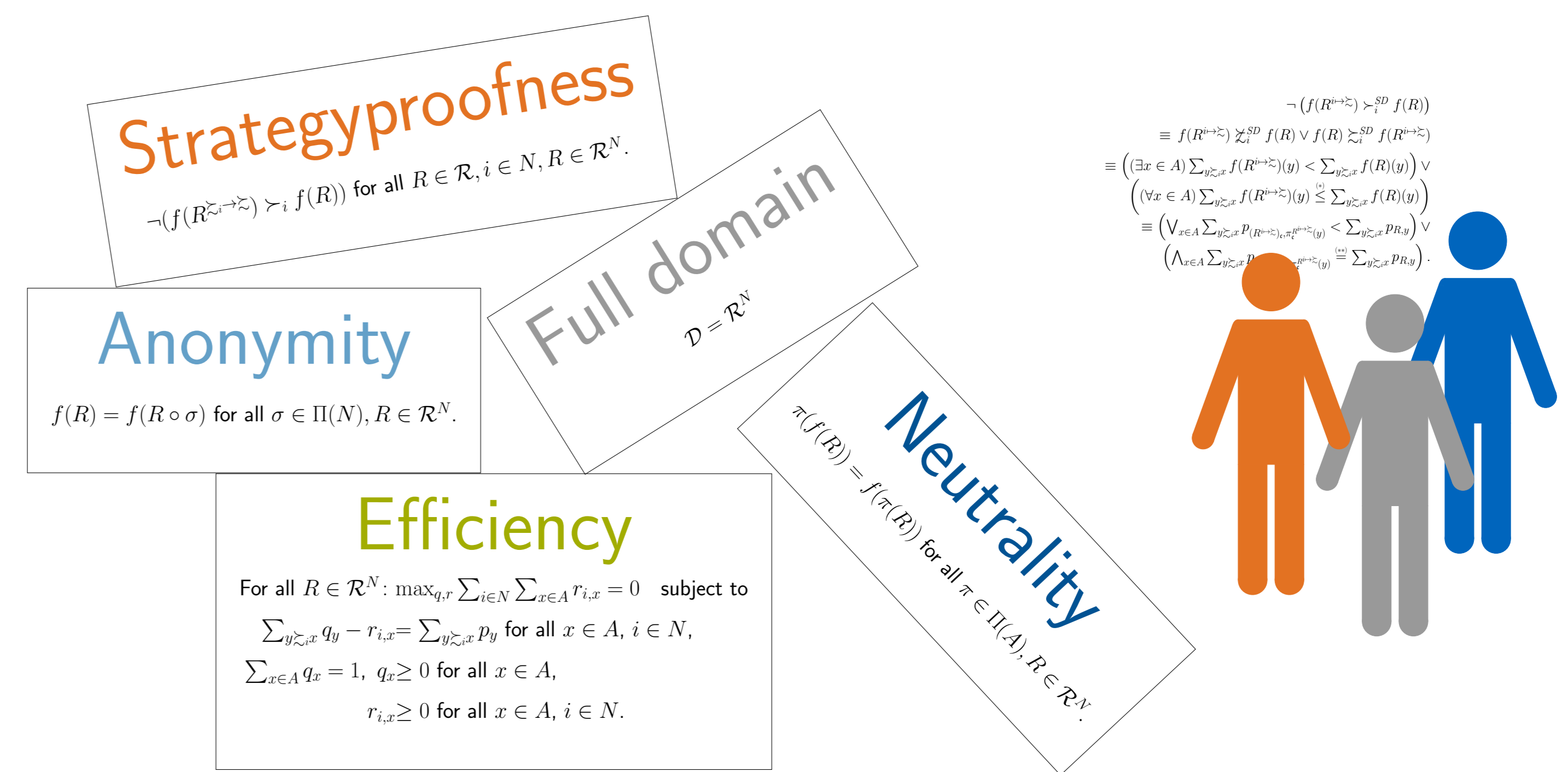
Christian Geist



for all utility functions \Leftrightarrow stochastic dominance:
 $p \succsim q$ iff $\sum p(x)u(x) \geq \sum q(x)u(x)$ for all consistent u
 $\Leftrightarrow p \succsim q$ iff $\sum_{y \succsim x} p(y) \geq \sum_{y \succsim x} q(y)$ for all x .

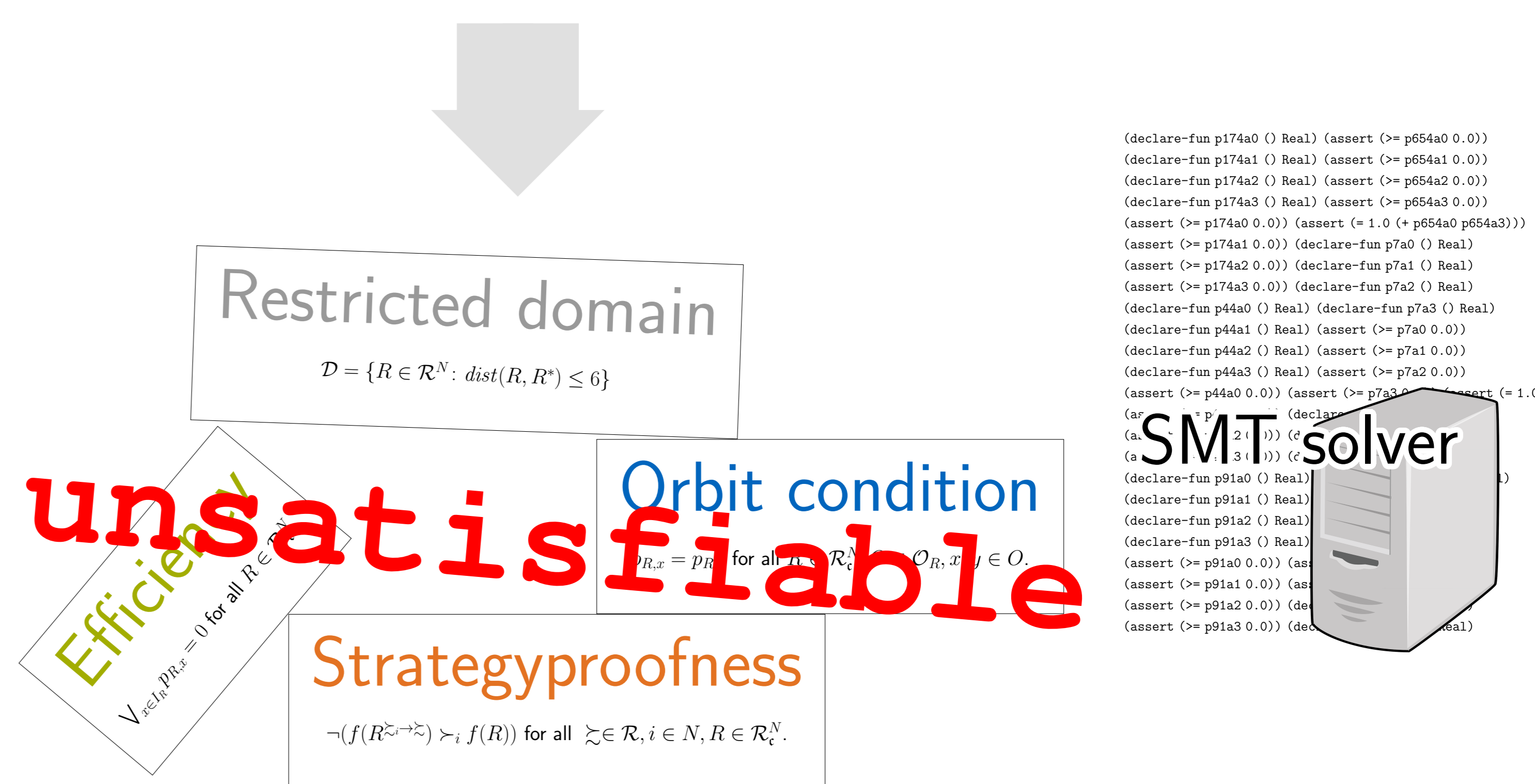
Efficiency

	1	2	3	4	
$1/2$	a, c	b, d	a, d	b, c	$1/2$
$1/4$	b	a	b	a	$1/2$
$1/4$	d	c	c	d	0
	$1/2 a + 1/2 b$				
	\succ_i				
	$1/4 a + 1/4 b + 1/4 c + 1/4 d$				inefficient!



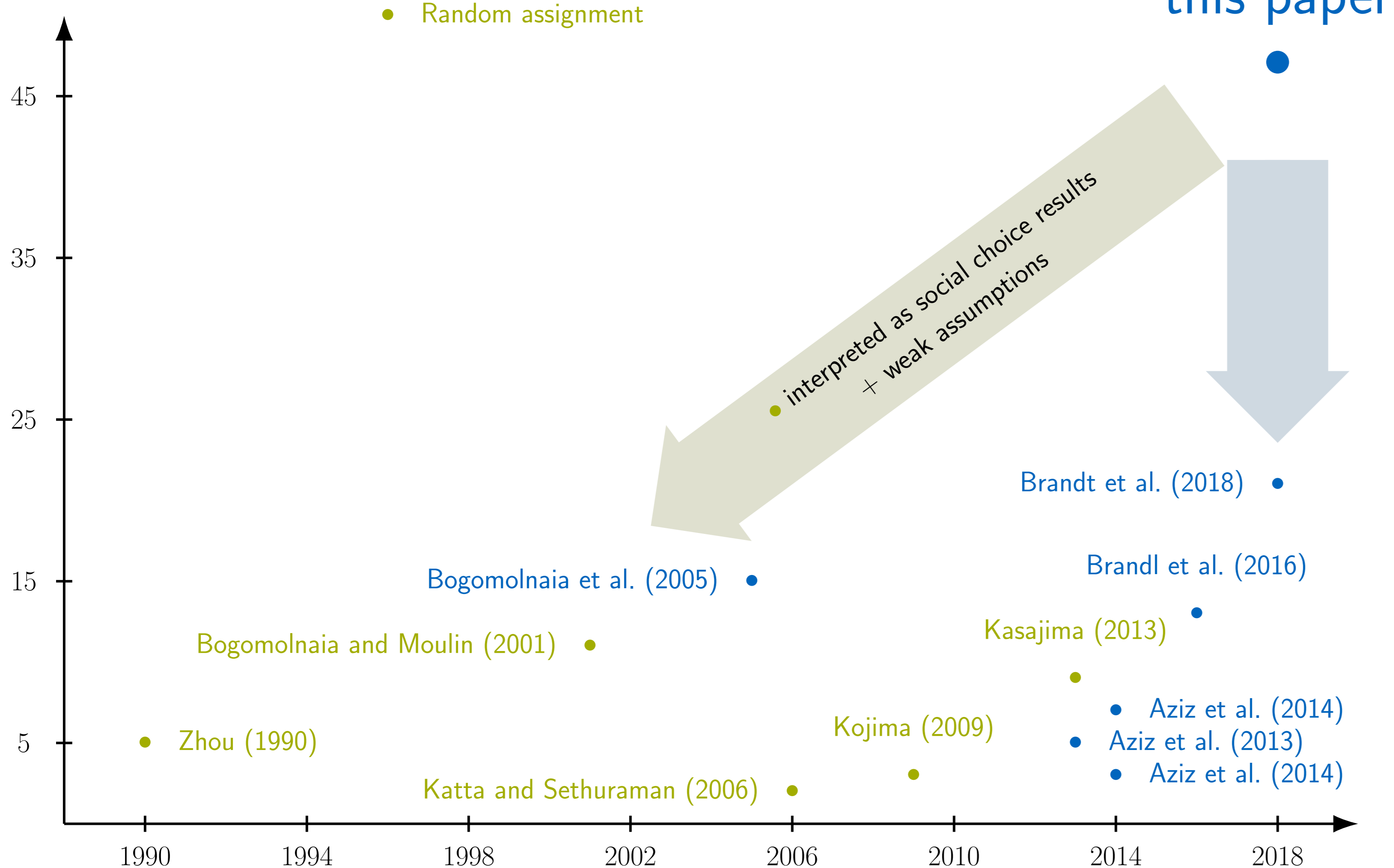
Strategyproofness

	1	2		1	2
	a	c		a	c
	b	d	\rightarrow	b	d
	c	a		d	a
	d	b		c	b
	$1/2 a + 1/2 c$			a	
	\prec_1			manipulable!	



#canonical profiles

- Social Choice
- Random assignment



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local sds impossibility =
  "pnd (sds R) a + pnd (sds R) b + pnd (sds R) c + pnd (sds R) d = 1"
anonymous sds agents alts sds +
neutral sds agents alts sds +
sd efficient sds agents alts sds +
subsection \open>Definition of Preference Profiles and P
by (auto simp add:
strategyproof sds age
for agents :: "agent
assumes agents go 4: "card agents \<go> 4"
and alts go 4: "card alts \<go> 4"
begin
lemma an sds: "an sds agents alts sds" by unfold
lemma sd post efficient sds: "sd post efficient s
lemma sd efficient sds: "sd efficient sds agents
lemma strategyproof an sds: "strategyproof an sd
lemma distinct agents' [simp]:
using distinct agents' by auto
"A1 \<noteq> A2" "A1 \<noteq> A3" "A1 \<noteq> A4"
"A2 \<noteq> A1" "A2 \<noteq> A3" "A2 \<noteq> A4"

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