Jasper De Bock
Alexander Erreygers
Floris Persiau

A convenient characterization of convergent upper transition operators

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upper transition operator

$$\overline{T} : \mathbb{R}^{\mathcal{X}} \to \mathbb{R}^{\mathcal{X}} : f \to \overline{T} f$$

T1. $\overline{T}(f+g) \leq \overline{T} f + \overline{T} g$

T2. $\overline{T}(\lambda f) = \lambda \overline{T} f \text{ if } \lambda \geq 0$

T3. $\overline{T} f \leq \max f$

ergodicity

for all $f \in \mathbb{R}^{\mathcal{X}}$

$(\overline{T}^n f)_{n\in\mathbb{N}}$ converges

to a constant

convergence

for all $f \in \mathbb{R}^{\mathcal{X}}$

$(\overline{T}^n f)_{n \in \mathbb{N}}$ converges

~~to a constant~~


RECEPTION
START
BAR
Welcome


RECEPTION
100%
BAR
Welcome

RECEPTION
0%
100%
BAR
Welcome


RECEPTION
0%
1/3
1/3
100%
1/3
BAR
Welcome


RECEPTION
33.3%
0%
33.3%
33.3%
BAR
Welcome


RECEPTION
0%
56.7%
6.7%
6.7%
6.7%
16.7%
6.7%
BAR
Welcome


What happens if he keeps on walking?
BAR
Welcome


RECEPTION
0%
0%
0%
66.7%
0%
0%
0%
BAR
Welcome
8.3%
8.3%
12.5%
4.2%


Does this change if the START is different?
BAR
Welcome


RECEPTION
START
BAR
Welcome


RECEPTION
0%
0%
0%
33.3%
0%
0%
0%
BAR
Welcome
16.7%
16.7%
25%
8.3%

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A convenient characterization of convergent upper transition operators

THEOREM

A precise Markov Chain is convergent if and only if all its maximal communication classes are aperiodic

THEOREM

A precise Markov Chain is convergent if and only if all its maximal communication classes are aperiodic


RECEPTION
BAR
Welcome

THEOREM

A precise Markov Chain is convergent if and only if all its maximal communication classes are aperiodic


RECEPTION
MAXIMAL COMMUNICATION CLAS
BAR
Welcome
MAXIMAL COMMUNICATION CLAS

THEOREM

A precise Markov Chain is convergent if and only if all its maximal communication classes are aperiodic


RECEPTION
MAXIMAL COMMUNICATION CLAS
BAR
Welcome
MAXIMAL COMMUNICATION CLAS

THEOREM

A precise Markov Chain is convergent if and only if all its maximal communication classes are aperiodic

RECEPTION
0%
0%
0%
33.3%
convergent
0%
BAR
Welcome
25%
16.7%
16.7%
8.3%


RECEPTION
0%
0%
0%
33.3%
convergent
ergodic
0%
BAR
16.7%
16.7%
8.3%

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A convenient characterization of convergent upper transition operators


RECEPTION
1/3
1/3
1/3
BAR
Welcome


RECEPTION
?
?
?
BAR
Welcome


RECEPTION
$\mathcal{P}_x$
?
?
?
BAR
Welcome

upper transition operator

$$\overline{T} : \mathbb{R}^{\mathcal{X}} \to \mathbb{R}^{\mathcal{X}} : f \to \overline{T} f$$

T1. $\overline{T}(f+g) \leq \overline{T} f + \overline{T} g$

T2. $\overline{T}(\lambda f) = \lambda \overline{T} f \text{ if } \lambda \geq 0$

T3. $\overline{T} f \leq \max f$

upper transition operator

$$\overline{T}\colon \mathbb{R}^{\mathcal{X}} \to \mathbb{R}^{\mathcal{X}} : f \to \overline{T}f$$

$$\overline{T}f(x) = \max_{p \in \mathcal{P}_x} E_p(f)$$

$\mathcal{P}_x$ for all $x \in \mathcal{X}$

convergence

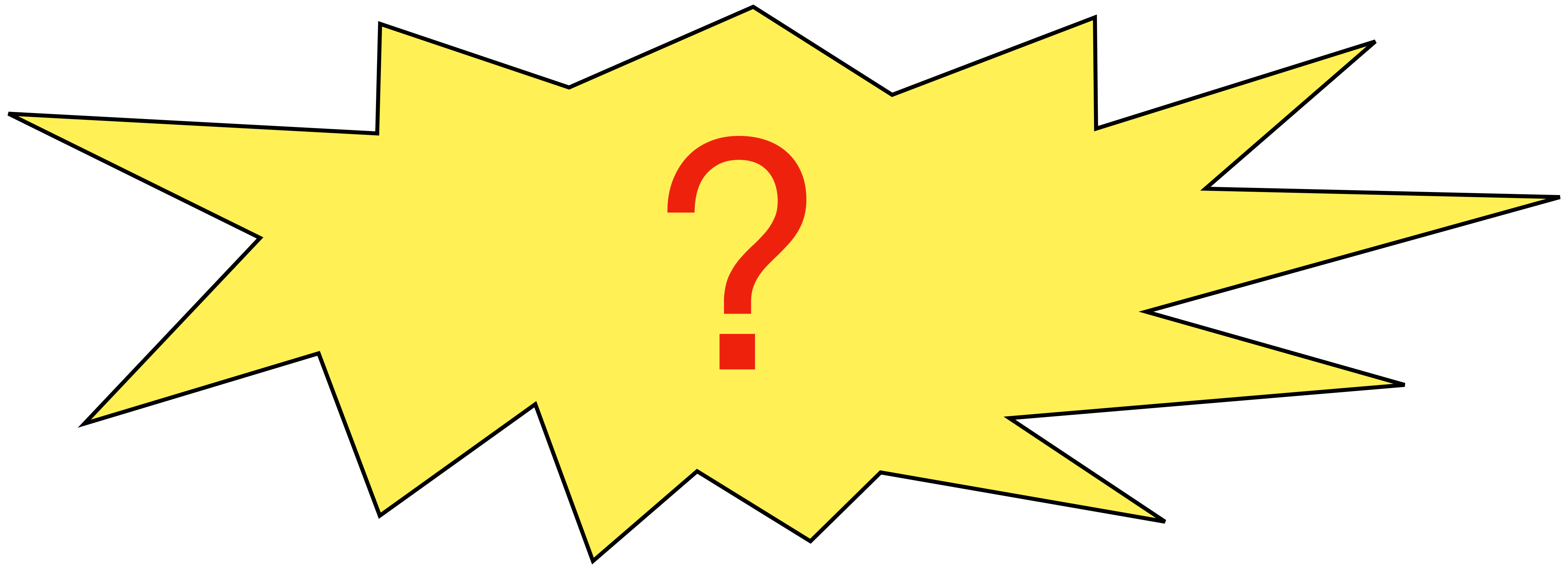
for all $f \in \mathbb{R}^{\mathcal{X}}$

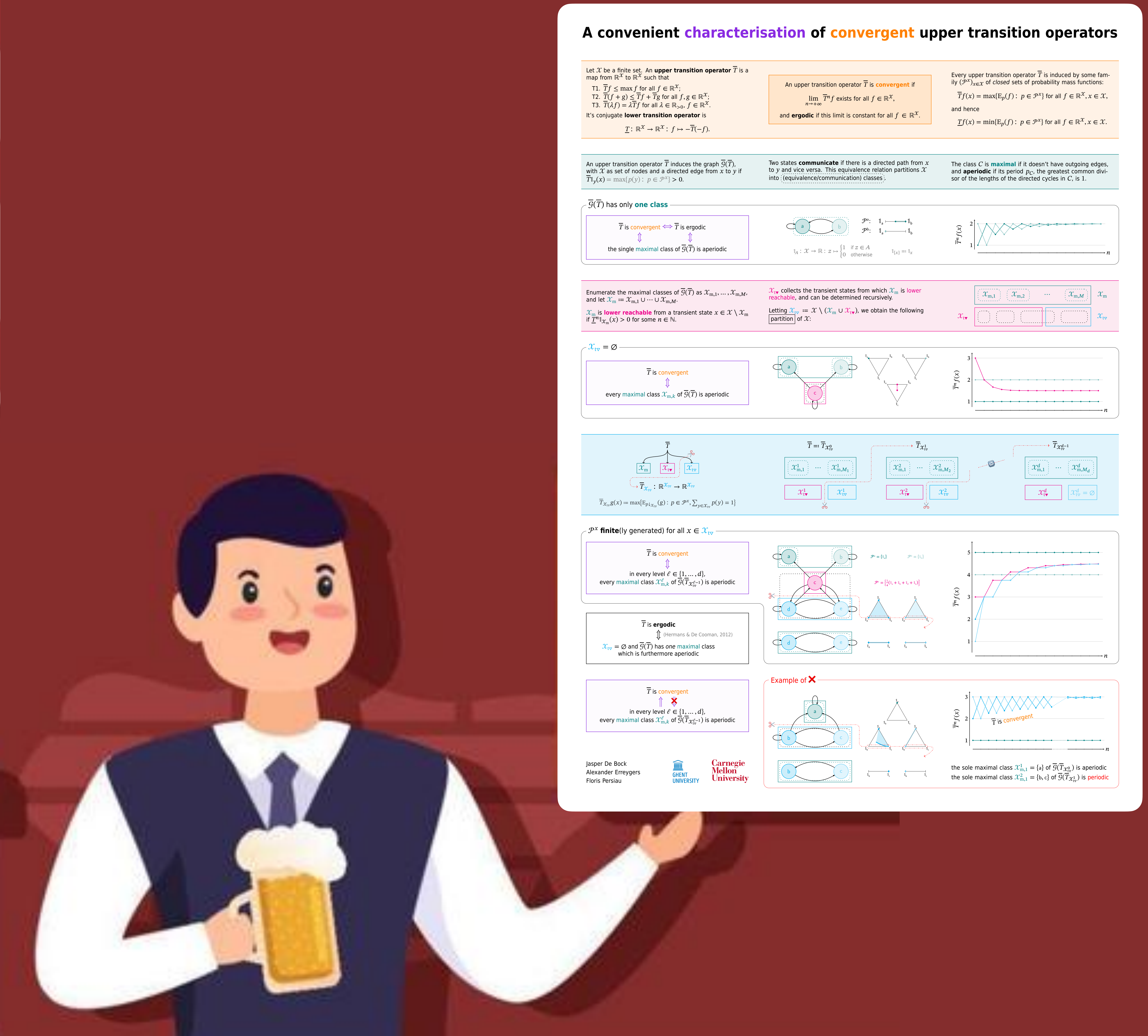
$(\overline{T}^n f)_{n \in \mathbb{N}}$ converges

~~to a constant~~

THEOREM

An **upper transition operator** is convergent if and only if …





SEE YOU AT THE POSTER!