



The commongood at the risk of algorithms

*What to do with AI?
April 9th 2021*

E.de Rocquigny

E. de Rocquigny



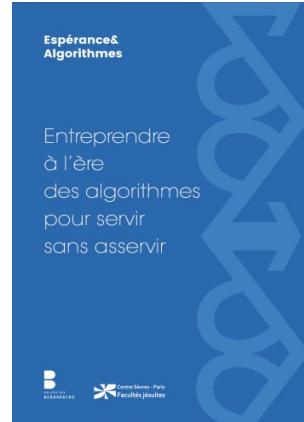
edr@operationdata.fr

MINI-CV

President of OperationData Inc. and advisor of half a dozen algorithmic companies, founder think-tank *Espérance & Algorithmes*, Former Full Professor in Applied Mathematics & Deputy Dean of Research at the Ecole Centrale Paris-Université Paris-Saclay, Former Senior Scientist EDF R&D, Expert at the National Research Agency, European Commission, Uni Bocconi.

Links

- *How to reinvent your business with data andAI:* [MOOC avec Bpifrance](#) (in French)
- *Managing uncertainty & creating value with robust algorithms :* [Reference Book](#)
- Manifesto www.esperance-algorithmes.org



Plan

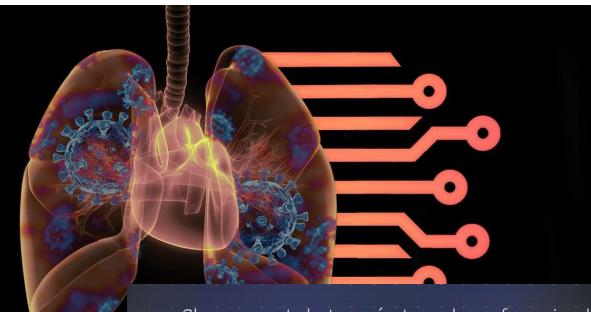
Algorithms - what are we talking about?

The need for algorithmic betting

Discernment: conditions for well-balanced
algorithmic services

Realworld tensions, levels of stakes -
creative compromise

Employment and AI



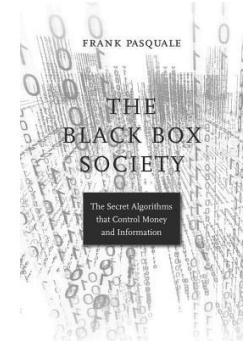
Algorithms

DISAPPEARANCE
OF WORK

Surveillance

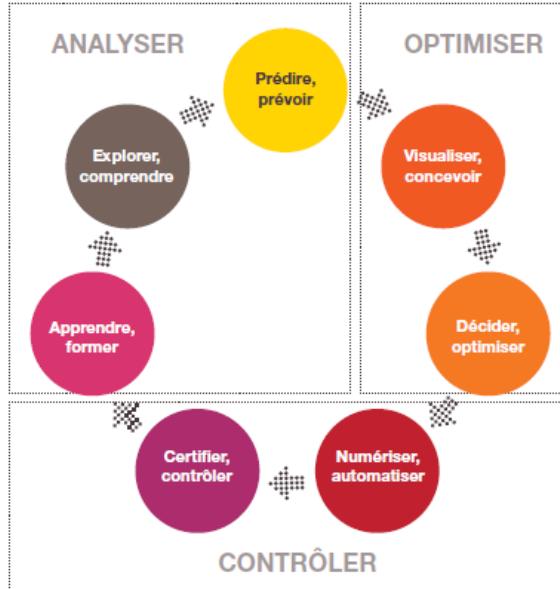
Discrimination

Filtering
bubbles



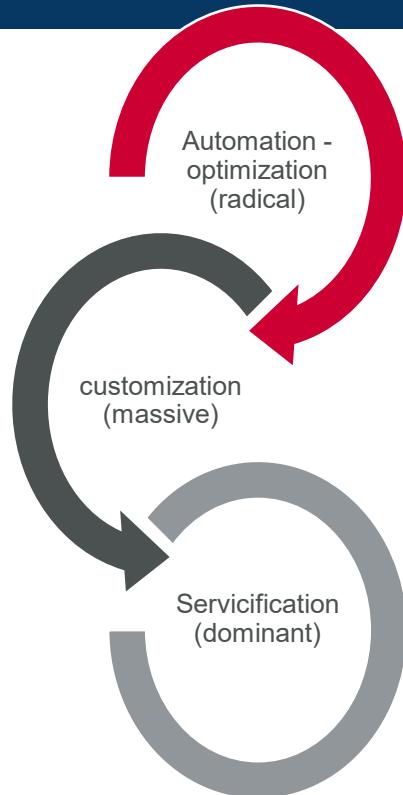


Universal digital machines

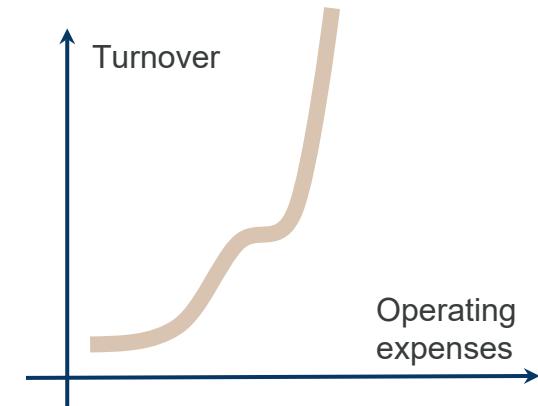


- ◆ Sales/customer experience
Wine, parking
- ◆ Innovation/product design
manufacturing
- ◆ production
Co-operatives, human services, recruitment
- ◆ Supply Chain
Construction, car fleet
- ◆ Control/ back office
Accounting, law, business services
- ◆ ...

Scalability & monopolies



“Chez Amazon, la distribution est vue comme un très grand problème d'ingénierie. Les algorithmes définissent tout, depuis la meilleure façon d'aménager la vitrine digitale jusqu'à la méthode optimale pour livrer un colis. D'autres grands du secteur dépensent des fortunes en publicité et n'embauchent que quelques centaines d'ingénieurs pour



What should be do ?

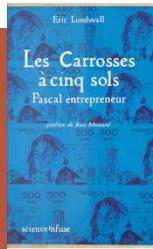
To the common good - *with all our intelligence*

Today I take heaven and earth as a witness against you: I put before you life or death, blessing or curse. So choose life, so that you and your descendants may live,... By loving the Lord your God, listening to his voice, attaching yourself to Him; this is where your life is. - ***Deuteronomy 30: 19-20***



*Indeed, creation eagerly awaits the revelation of the sons of God. (...) she kept the hope of being freed from the slavery of degradation, to know the freedom of glory given to the children of God. As we well know, the whole creation groans, it passes through the pains of a birth that lasts even longer. (...). For we have been saved, but it is in hope - ***St-Paul, Romans 8: 19-24****

If nothing should be done for the certain, (...) nothing should be done at all because nothing is certain (...) But when we work for tomorrow and for the uncertain, we act with reason: because we must work for the uncertain by the rule of parties that is demonstrated. - ***Pascal, Pensées***



"Choose life..."



CO2housing -100% by 2050?



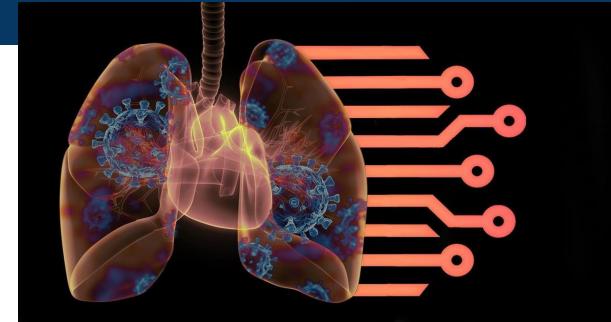
Sustainable agriculture



40% bullshit jobs
+x% unemployed/ covid



Deep excluding poverty



How can we avoid 2021 = 2020?



3500 dead/yr, 80% human "stupidity"

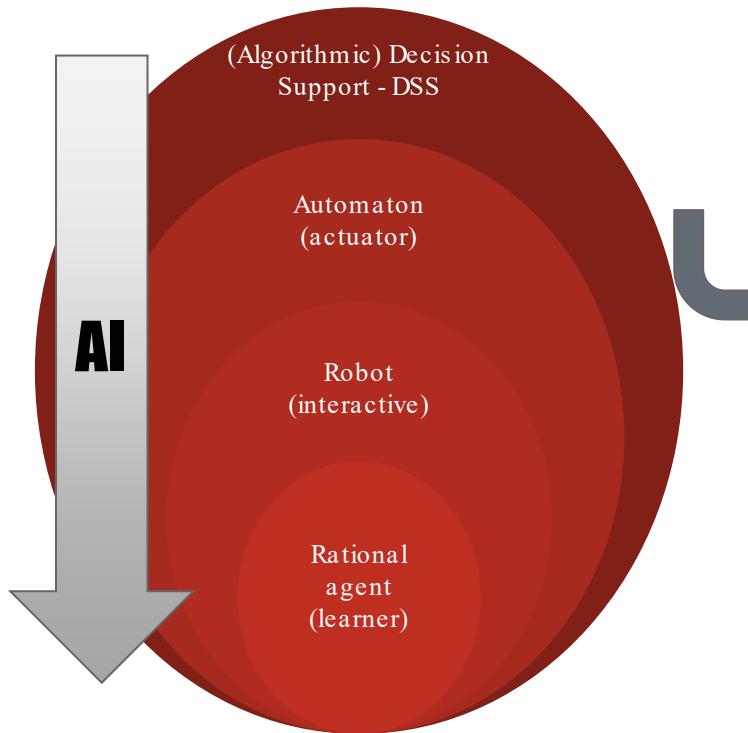
#1 - BENEFIT: Algorithms are a benefit for the co-creator and responsible man who discerns the good uses - *Manifesto Espérance & Algorithmes*

Decision support, automata, AI ... *persona (humana) ex - machina*

From the DSS (inc assisted driving): human elementary choice (inc. a few clicks)

....

up to the learning agent: non-human elementary choice, ... but its setting the rest

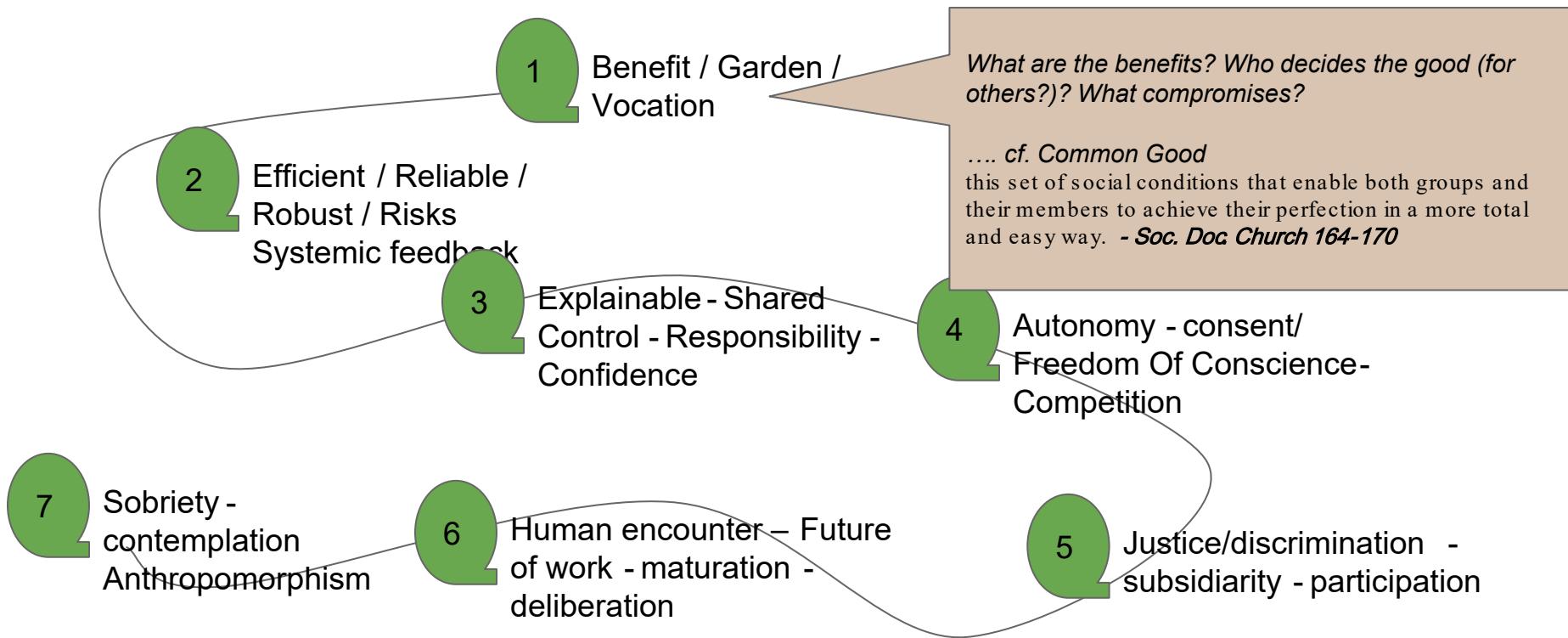


Decision in the full sense: reason + free will (Aristotle), therefore the prerogative of man alone, neither of the beast nor of the machine ...

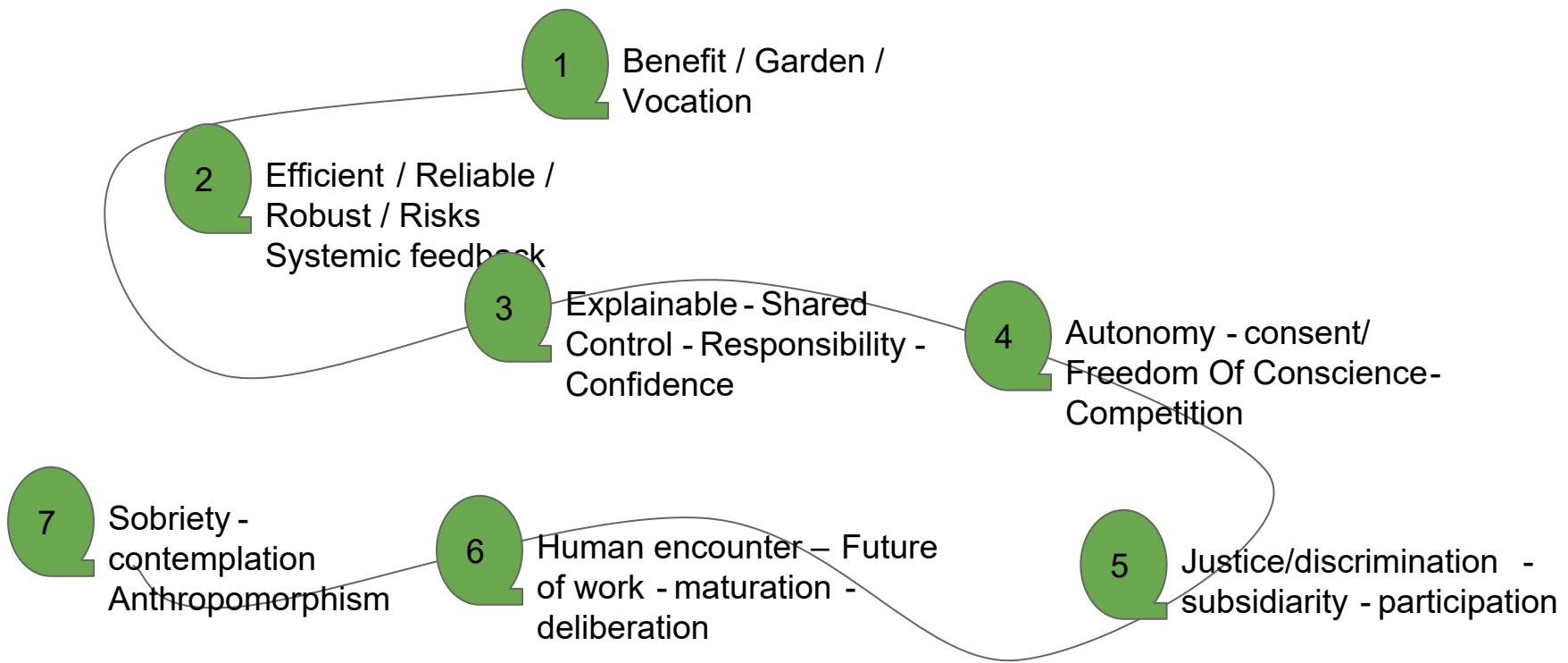
Who decides, who's responsible?

*Designer(or his Employer, his s/t ...)
Seter
Data purveyor
certifier
Consultant
end user
... cf RGPD Europ. Parliament/high risk*

A necessary bet ... Is it fair ?

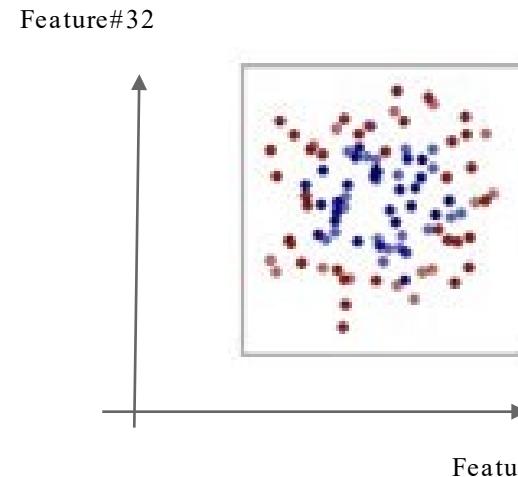
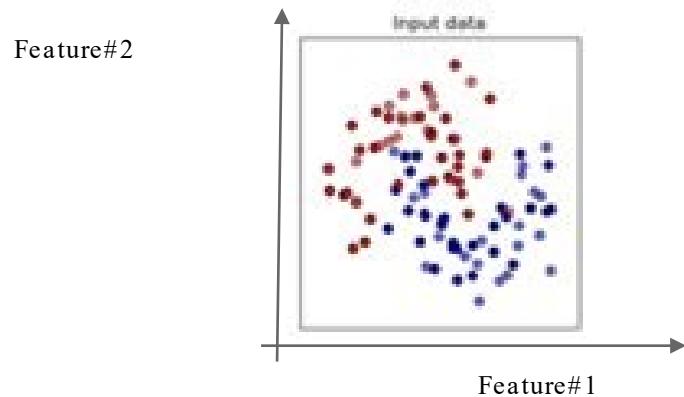


A necessary bet ... Is it fair?



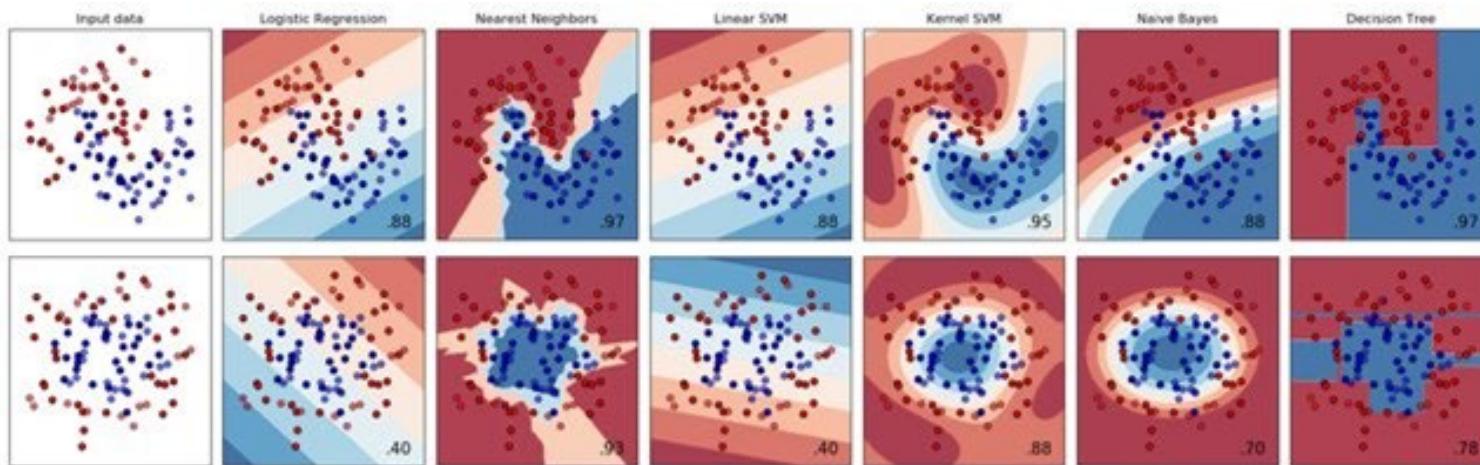
96% acc. to our Machine Learning ... – true ?

Discern the red of blue over past data to guess the color of a future case



Trustworthy ML models ?

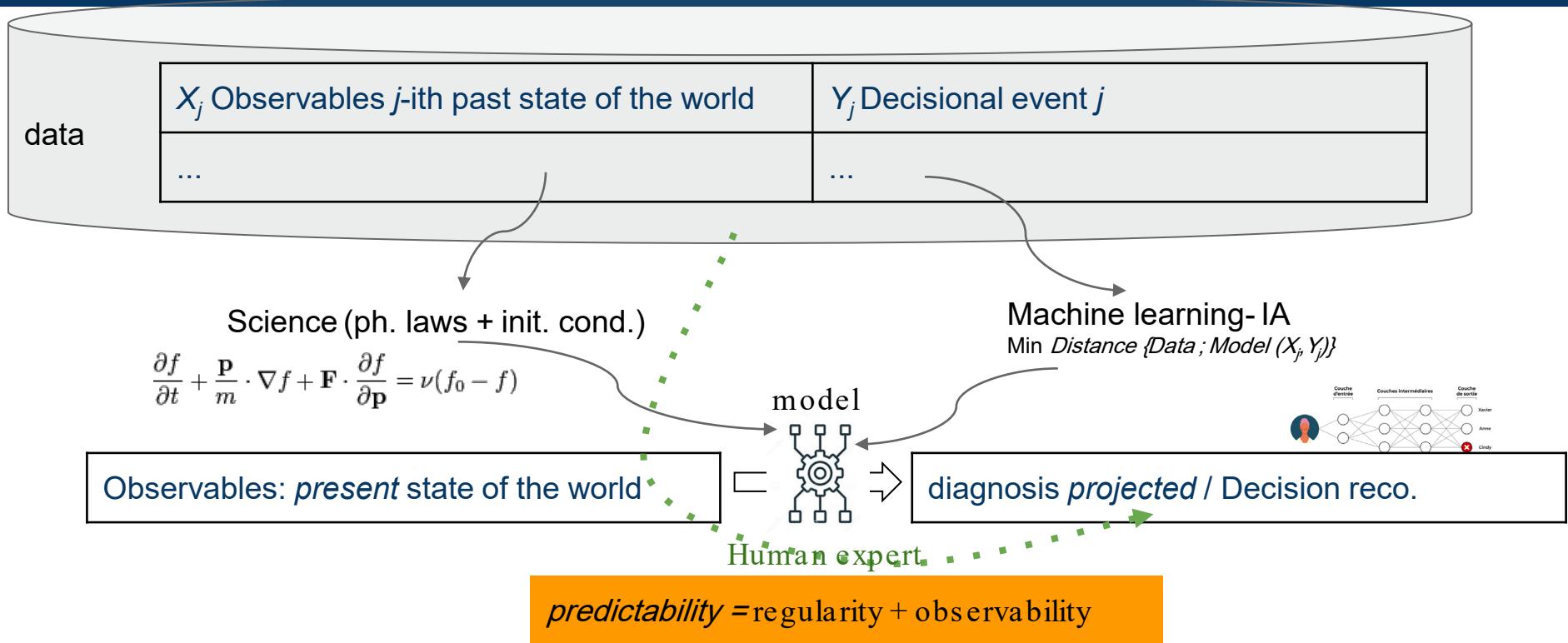
Discern the red or blue on past data to guess the color of a future case ...



Gizem Yetiş, Ozan Yetkin: A Novel Approach for Classification of Structural Elements in a 3D Model by Supervised Learning September 2018 Conference: Computing for a better tomorrow - Proceedings of the 36th eCAADe Conference Volume: 1

How does this discernment evolve according to: inaccuracy of the dots? multiplication of data? ...
The blue-red interface: how thick, what decision, what risk?

Paradigm of decision support via model/algo /AI or human expertise



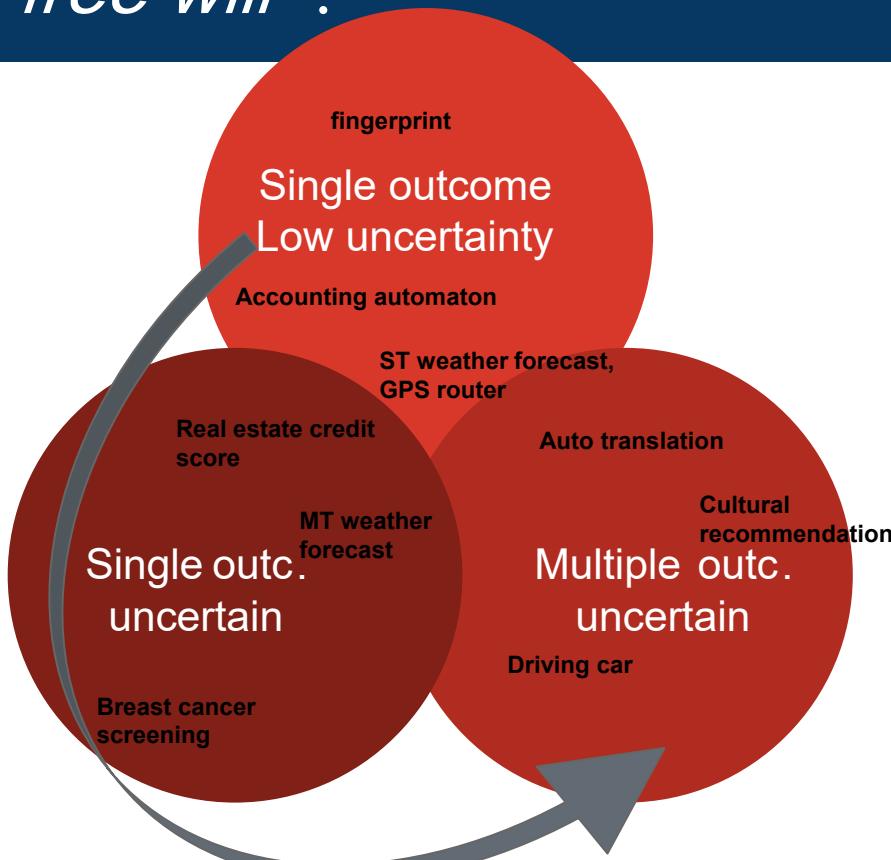
Inside generalisability error

A good model : falsifiable & well understood failures

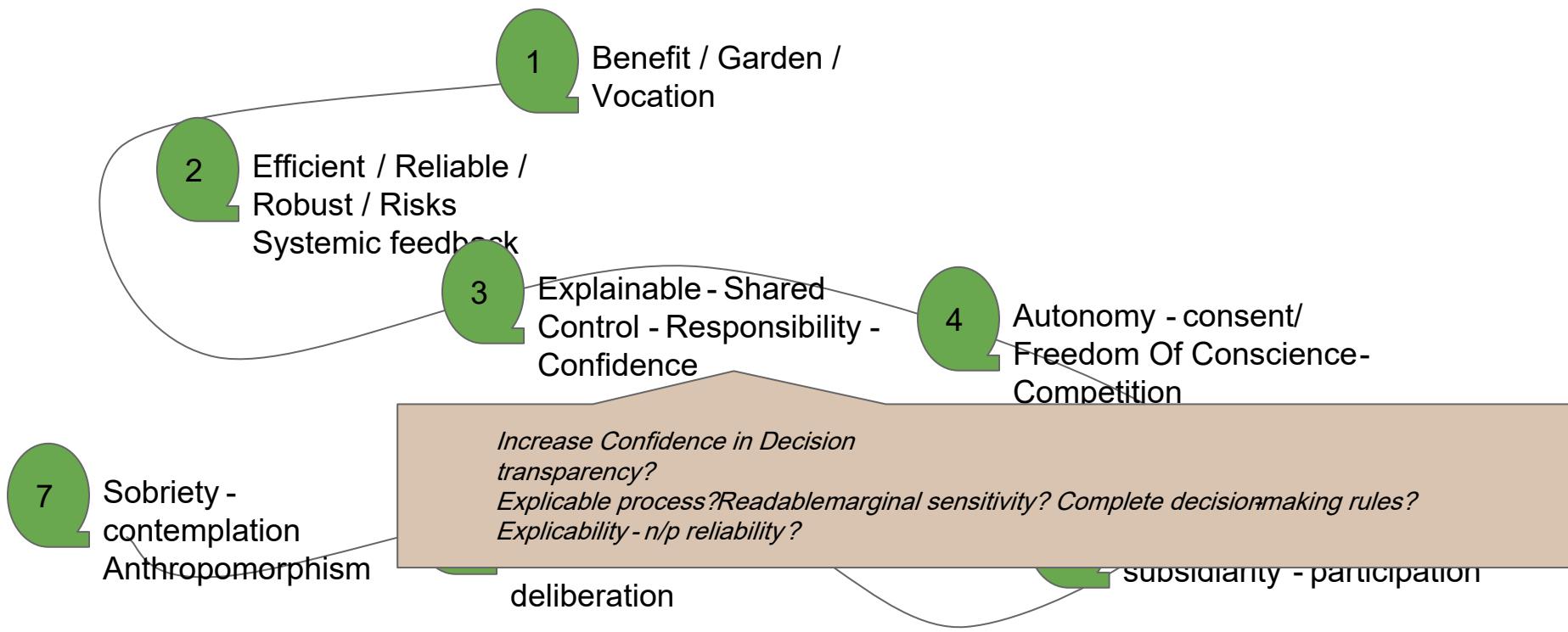
regularity	determinist	$x \rightarrow y$: same causes > same effects (in the future, as in the past)	Permanence of physical /phenomenological laws, rules ...
	Stationnarity (static)	$F(X; Y x)$ remains stable: causes > effects at comparable frequencies - stable frequency of causes (in the future, as in the past)	Permanence of profiles - user behaviors etc.
	Stationnarity (dynamic)	The cause-effect relationship $F(X t; Y x,t)$ drifts according to a stable trend in frequency (hence learnable ...)	Climate change rising temperatures Pb of human or environmental rapid feedback systems
	Interpolability	A causes not observed but "close" to observed causes correspond to "close" effects	Simulation/Forward-Looking Requirements Limitations of chaotic systems
observability	Fundamental	& The state (and its variations): observable non-destructive	Scale >> Heisenberg uncertainty Pb of economic forecasts
	technological	Key observables are measurable with sufficient precision/sampling via sensors	Difficult for climate, underground etc.
	conomical	Key observables are measurable at a reasonable cost/precision	Difficult for the human body, cultural preferences, ...

Predictability, performance *good news for free will !*

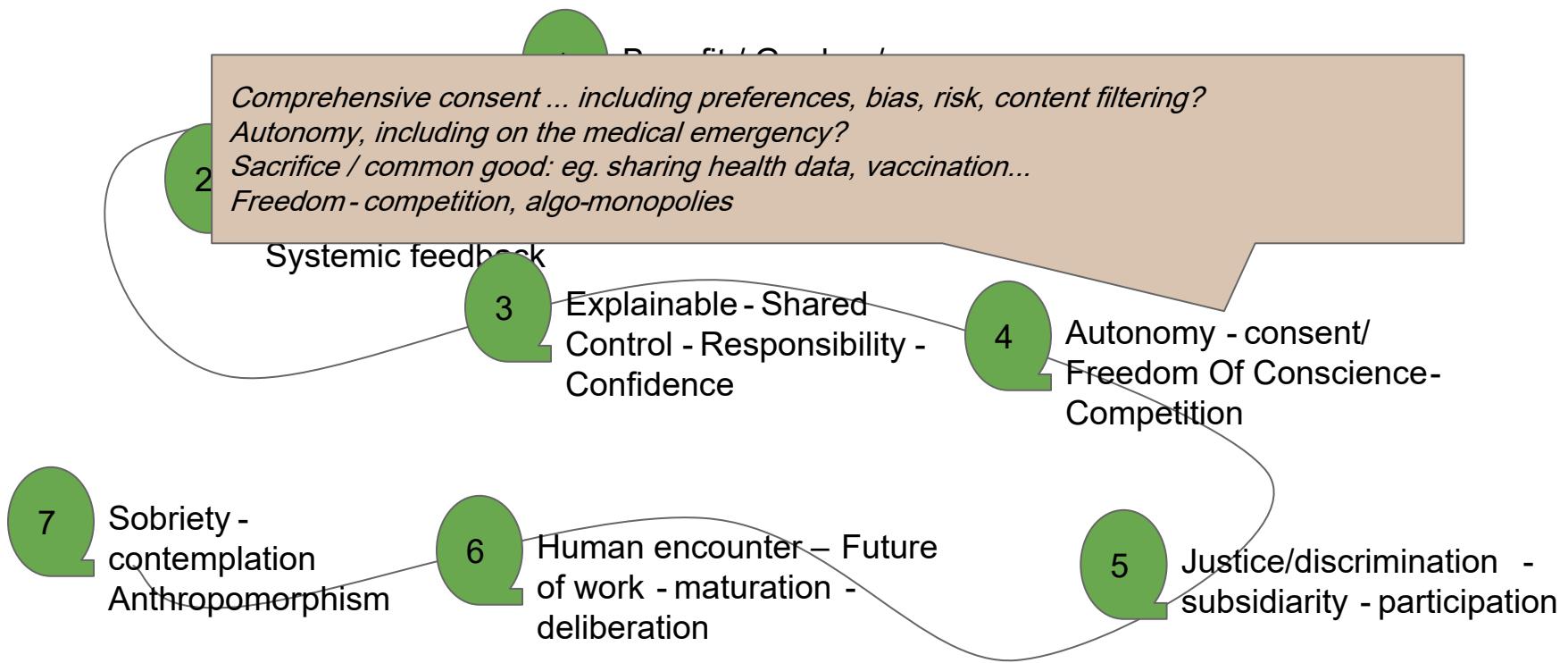
, uncertainty ...



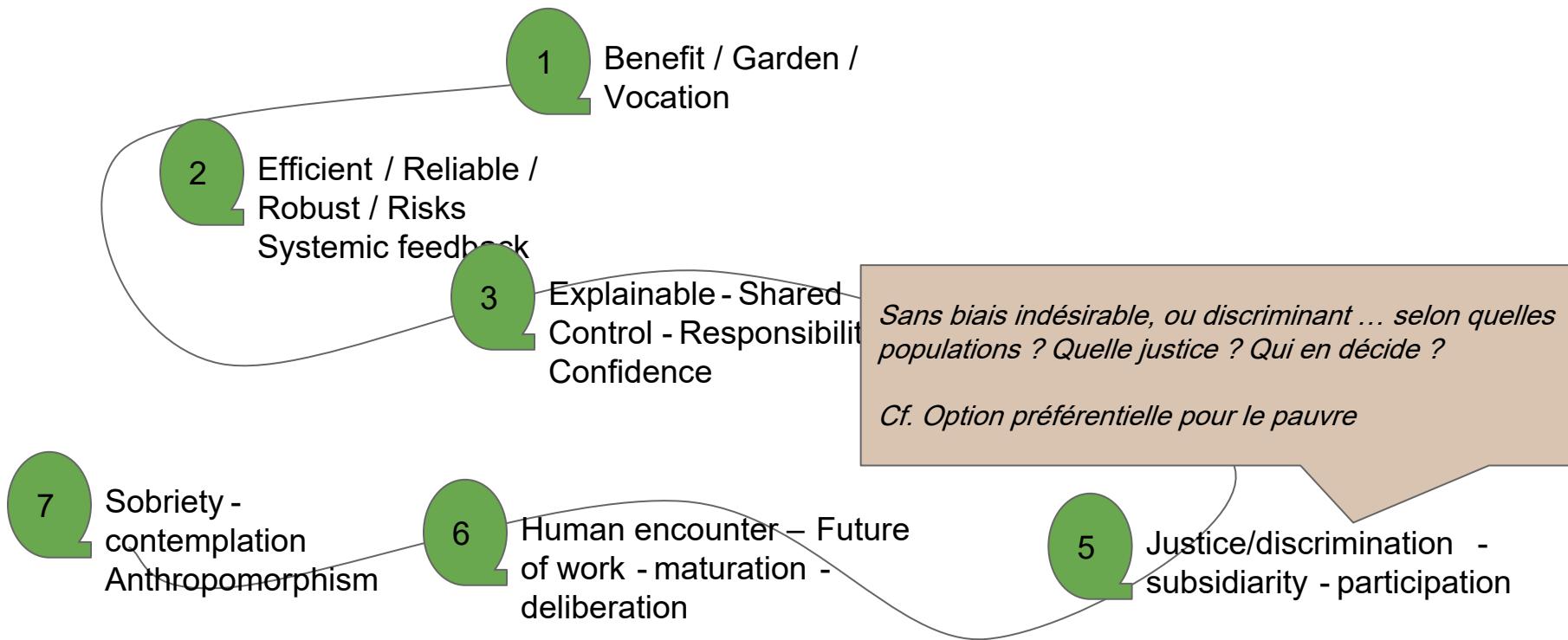
A necessary bet ... Is it fair?



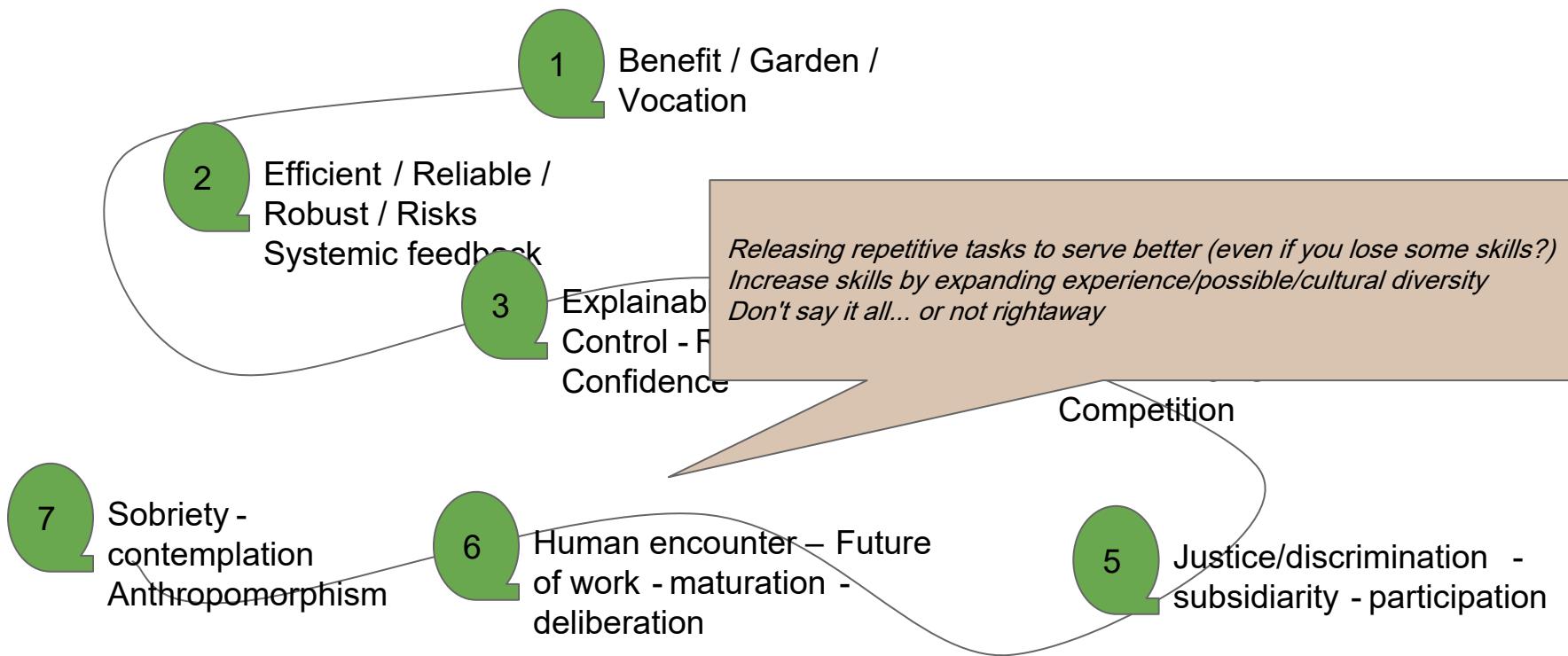
A necessary bet ... Is it fair?



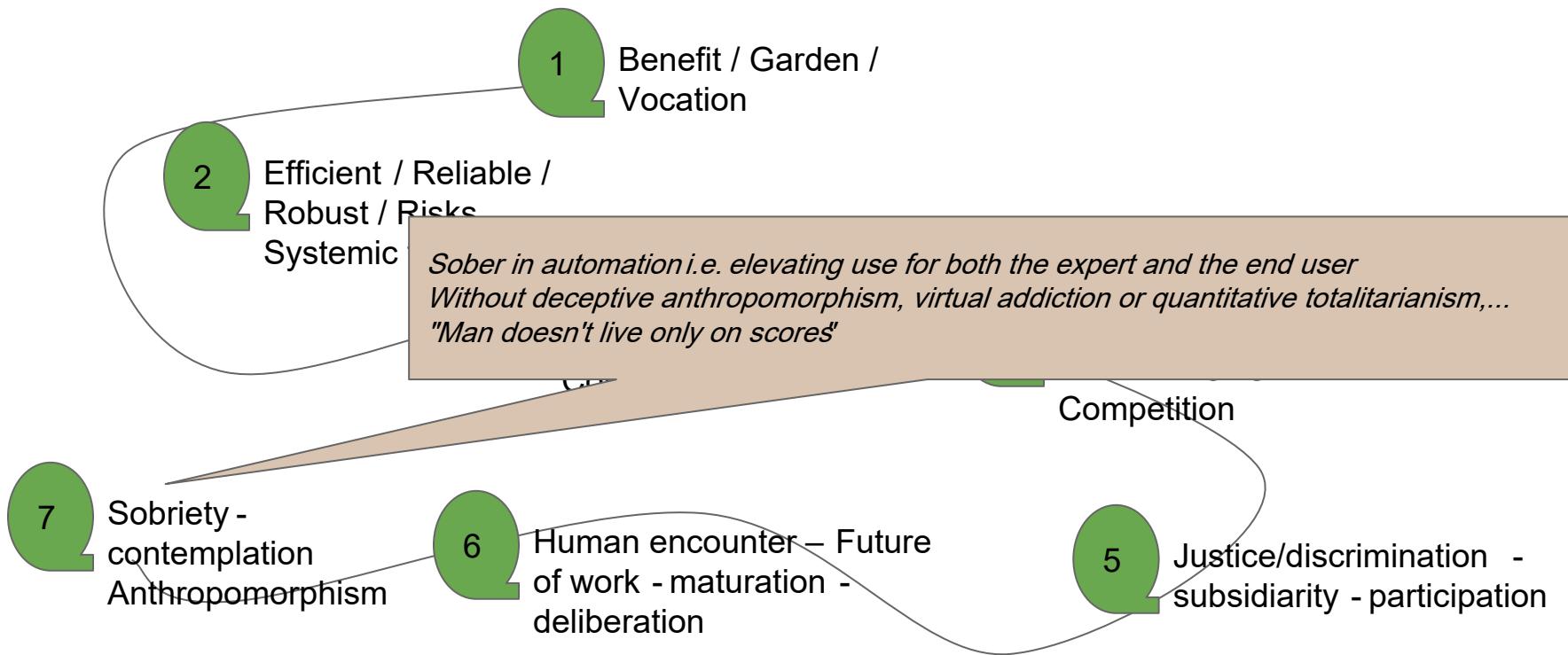
A necessary bet ... Is it fair?



A necessary bet ... Is it fair?

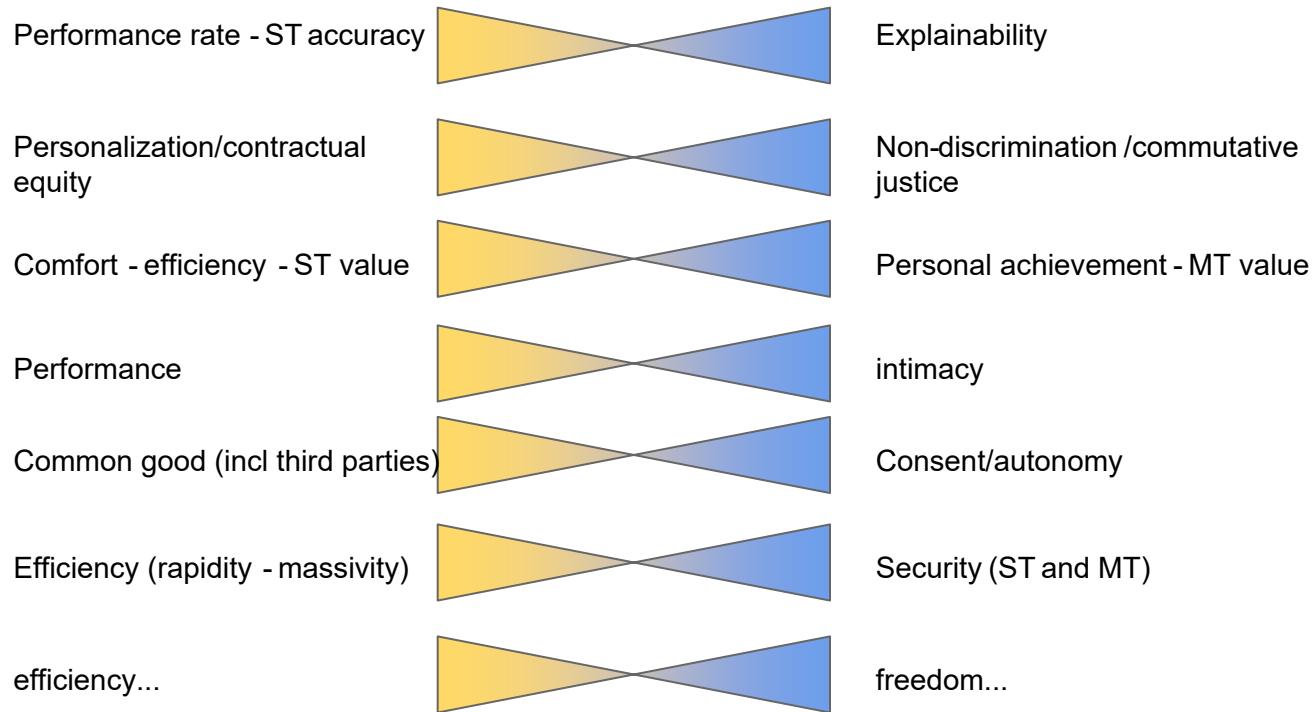


A necessary bet ... Is it fair?



... theoretical expectations that are neither
always feasible nor necessarily desirable ...

The Real world - Ethical Tensions in Decision Support



Decision - making natures and DSS stakes

Moderate risk

Undetermined risk

High risk

weather forecast

Travel recommendation

Advertising display

Automation of support
services

Chatbot/commercial call
centre

...

Open exploration - forecast in law

Recommendation cultural content

Documentary research

Recommendation meeting / CV

Real estate credit

Weather forecast / performance /
sales / geotech ...

Thermal comfort steering

Fraud detection

Non-urgent medical diagnosis

....

Multiple reco. - point forecast

Driving autonomous vehicle

off-site clean

Military robots

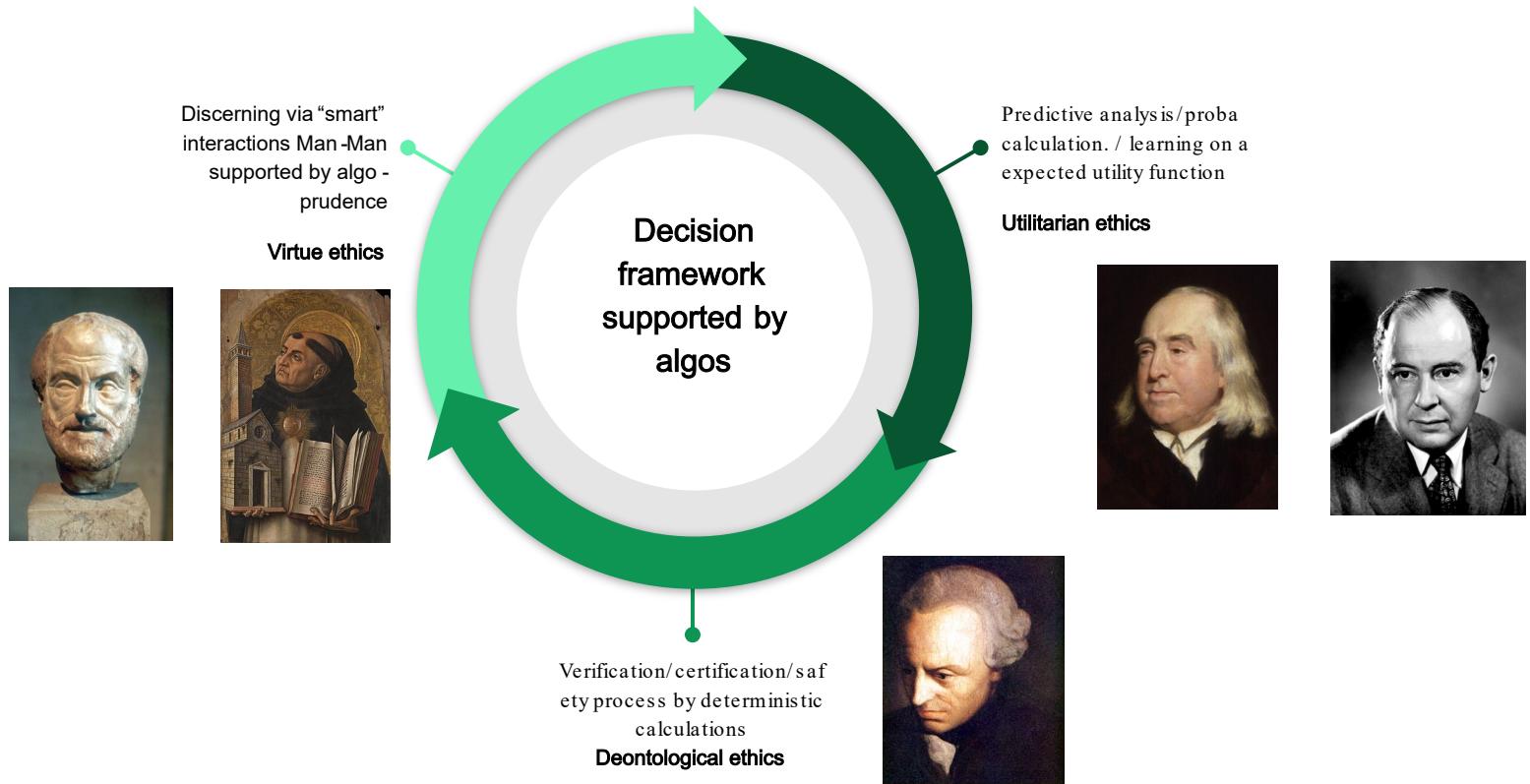
Facial recognition

Medical emergency diagnosis

...

Autonomous agent – single
recommendation

What ethics should ultimately *discern* the common good



Employment and AI

Risks

- Short-term job cuts, or even jobs, through automation
- Medium-term cancellations of Luddites/competitive delays
- Dehumanizing work through excessive digital mediation
- Destroying skills by over-delegation to algorithms
- Increase career/exclusion silos

Promises

- Fluidizing the labour market
- Enlarge recruitment basis/bias of experience silos, atypical career brakes, long-term exclusion of people
- Deepen people's vocation and therefore joy at work
- Raising work by automating "stunning" tasks

Employment and AI



*"Creative destruction" is not necessarily as quick as announced
47% endangered jobs (2013) => +10% jobs (2020 pre-covid)*

It is those who seize transformations rather than undergo or repel them that shape the best opportunities

Creative compromises to be found

(...) **Vocation** - the inimitable creativity of the human person is necessary to put algorithms at the service of the common good (...)

Benefit	Human Encounter
Shared Mastery	Work
Garden	Freedom of Consciousness
Subsidiarity	Contemplation
<i>Vocation</i>	Participation
Human Person	Competition
Risks	Universal Destination

**Espérance &
Algorithmes**

Annexes

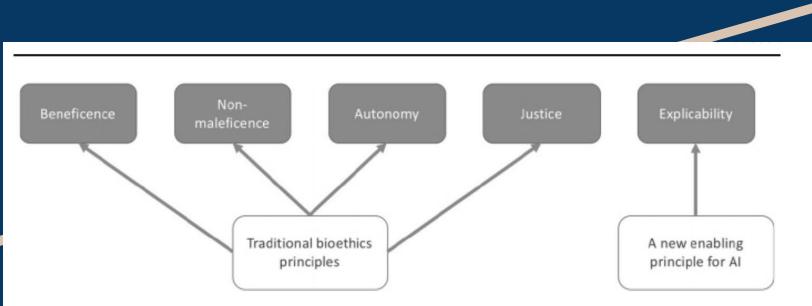
Déterministe, probabiliste, prédictible, incertain, risqué ...



Déterminé / déterministe / causal	Indéterminé / probabiliste / ouvert
Système sous-jacent observable - prédictible	Système indéterminé - observabilité partielle - Dynamique incertaine
Algo en phase prédictive	Aléa données/processus d'apprentissage Prédiction randomisée Interactions / rétroactions MT
Certification déterministe: ... un leurre ? (complexité des systèmes, biais sélection ...)	Certification probabiliste: jamais de garantie certaine/ni acceptable a posteriori
Biais cognitifs humains Expérience bornée du meilleur expert	Liberté de l'agir humain / ouverture Perception humaine étendue

Manifeste

Comment entreprendre à
l'ère des algorithmes
pour servir le bien
commun sans asservir



<i>Bienfait</i>	Rencontre Humaine
Maîtrise Partagée	Travail
<i>Jardin</i>	Liberté de Conscience
Subsidiarité	Contemplation
<i>Vocation</i>	Participation
Personne	Concurrence
Risques	Destination Universelle

**Espérance &
Algorithmes**

OAD - bien déterminé, univoque, peu incertain



En théorie: $x(t^\circ) \rightarrow D=y(t^\circ)$ est univoque.

Pour bien décider, il suffit d'avoir

- > les données $x(t^\circ)$
- > Et l'apprentissage de la règle $x \rightarrow D$

Un algo peut mieux discerner que le meilleur expert humain

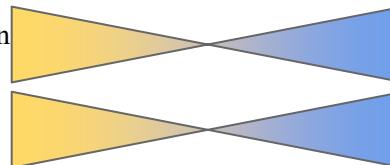
Discernement pratique

Précision & robustesse (généralisabilité, représentativité, stabilité num., observabilité, stationnarité, ...)

Contrôlabilité des erreurs et équité de traitement

Développement des compétences / employabilité

Taux de Performance - précision
CT

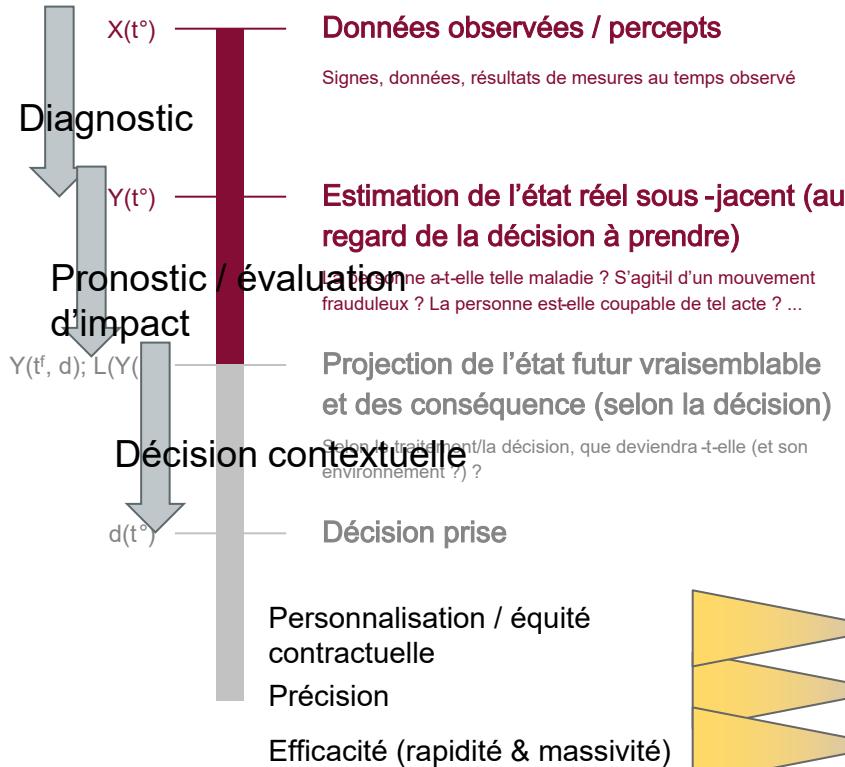


Explicabilité

Confort - efficacité - valeur CT

Réalisation personnelle - valeur MT

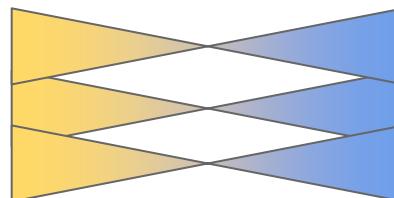
OAD - bien déterminé, univoque mais incertain



En réalité: $X(t^\circ)$ observe imparfaitement l'état réel $x(t^\circ)$ et/ou la règle $x \rightarrow d = y(t^\circ)$ est insuffisamment apprenable faute d'assez de données fiables et/ou la règle $x \rightarrow d$ est ambiguë, ... et la décision porte sur un état futur $y(t^\circ)$ dépendant d'une dynamique au pronostic non univoque selon $y(t^\circ)$

Discernement pratique

Périmètre d'observabilité machine vs. par l'agent humain
Contrôlabilité des erreurs et équité de traitement
Temps de la décision et espace relation humaine/ de maturation



Non-discrimination / justice commutative
Intimité
Consentement / autonomie

OAD - bien multivoque



En réalité: $x(t^\circ) \rightarrow D=y(t^\circ)$ est multivoque, soit par insuffisante observabilité du réel soit par dilemmes de préférence. Pour bien décider, il faut

- > une appréciation fidèle des possibles $Y_i(t^\circ)$
- > un modèle accepté de préférence aux conséquences D_i

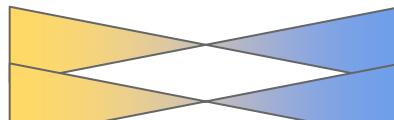
Un outil peut permettre à une personne de mieux décider

Discernement pratique

Consentement au modèle de préférences
Ajustement des préférences selon l'horizon / asservissement aux silos / rétroaction sur l'apprentissage
Elargissement vs. appauvrissement de l'expérience décisionnelle

Confort - efficacité - valeur CT

Précision



Réalisation personnelle - valeur MT

Intimité

Types d'algorithmes et enjeux d'OAD

Enjeu fort

???

Enjeu faible

Contrôle/commande de systèmes automatisés

Recommandation (ou score, traduction/résumé, ...) mono-résultat / classif. binaire

Sélection automatisée

...

Exploration de données “fermée” (exfiltrage, réduction irréversible ...)

Recommandation (ou score, traduction/résumé, ...) multi-résultat

Prévision de tendance simple

....

Exploration de données “ouverte”

Prévision explicite en incertitude

...

Prédicibilité, incertitudes, performance ...

Univoque/ peu incertain	Prévision météo CT, routeur GPS	Prédicibilité forte à CT, peu d'attente explicabilité perte de compétences
	Annotation comptable	Multivocité en réalité indésirable
	Reconnaissance empreinte	...
Univoque / incertain	Crédit immobilier	Observ. Moyenne, dynamique incertaine
	Prévision météo MT	Faible observ, dynamique incertaine
	Diag géotechnique	Faible observabilité, dynamique certaine
	Diag dépistage cancer sein	Faible observ, dynamique incertaine
Multivoque / incertain	Recommandation culturelle, rencontres, recrutement ...	Faible observabilité, Rétroaction forte,
	Drug discovery	Observabilité forte, dynamique incertaine
	Traduction automatique, résumé, analyse autom. CV, ...	Observabilité moyenne, préférences incertaines
	Arrêt automatique véhicule autonome / dilemme tramway	Observabilité moyenne (mais > l'humaine ?), préférences incertaines, dynamique très incertaine, rétroaction comportementale forte

FRANK PASQUALE

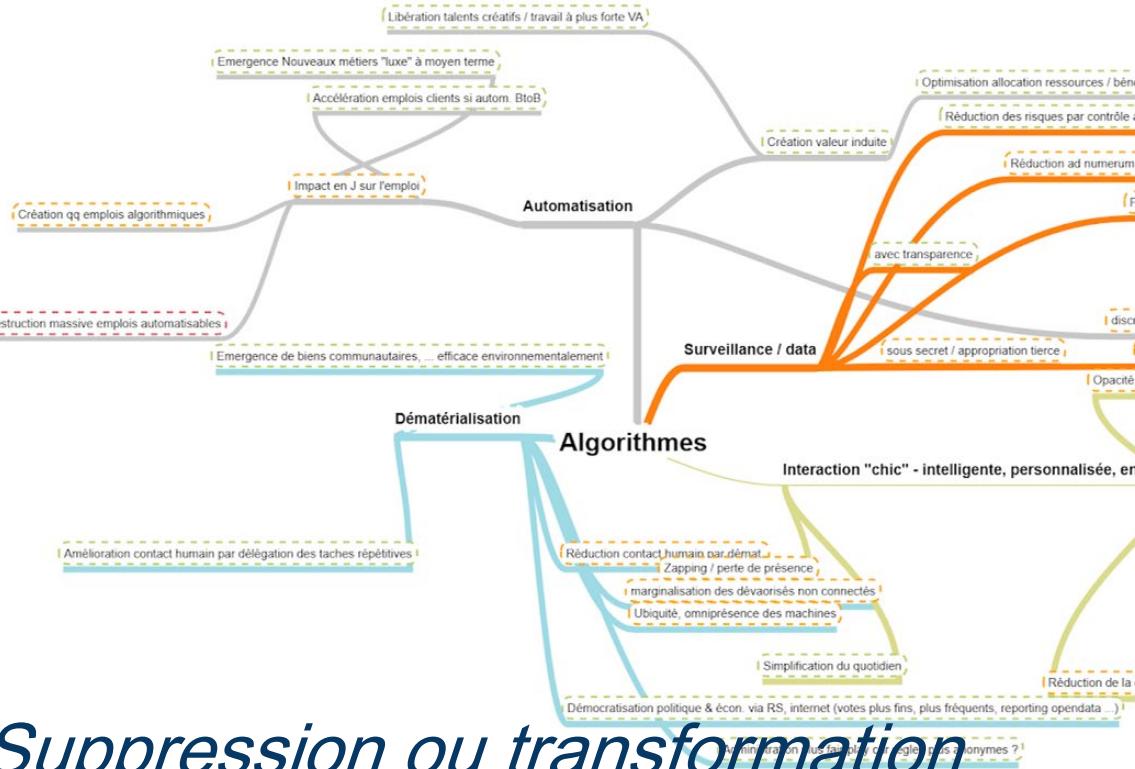
THE BLACK BOX SOCIETY

The Secret Algorithms
that Control Money
and Information



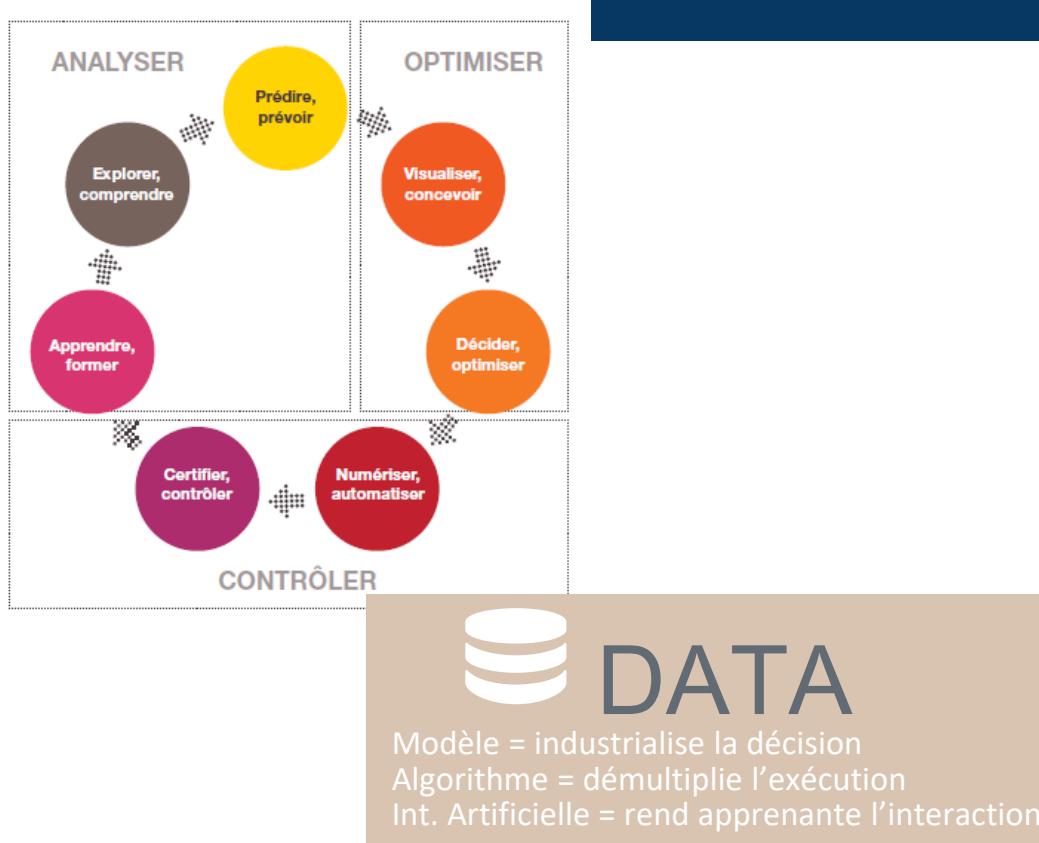
*Espionnage ou
Alliance ?*

Libération ou asservissement ?



*Suppression ou transformation
des emplois ?*

Machines numériques universelles



- ◆ Ventes / expérience client
- ◆ Innovation / conception produits
- ◆ Production / services à la personne, recrutement
- ◆ Supply Chain
- ◆ Contrôle / back office
- ◆ ...