What does it mean to ‘solve’ the problem of discrimination in hiring? Social, technical and legal perspectives from the UK on automated hiring systems

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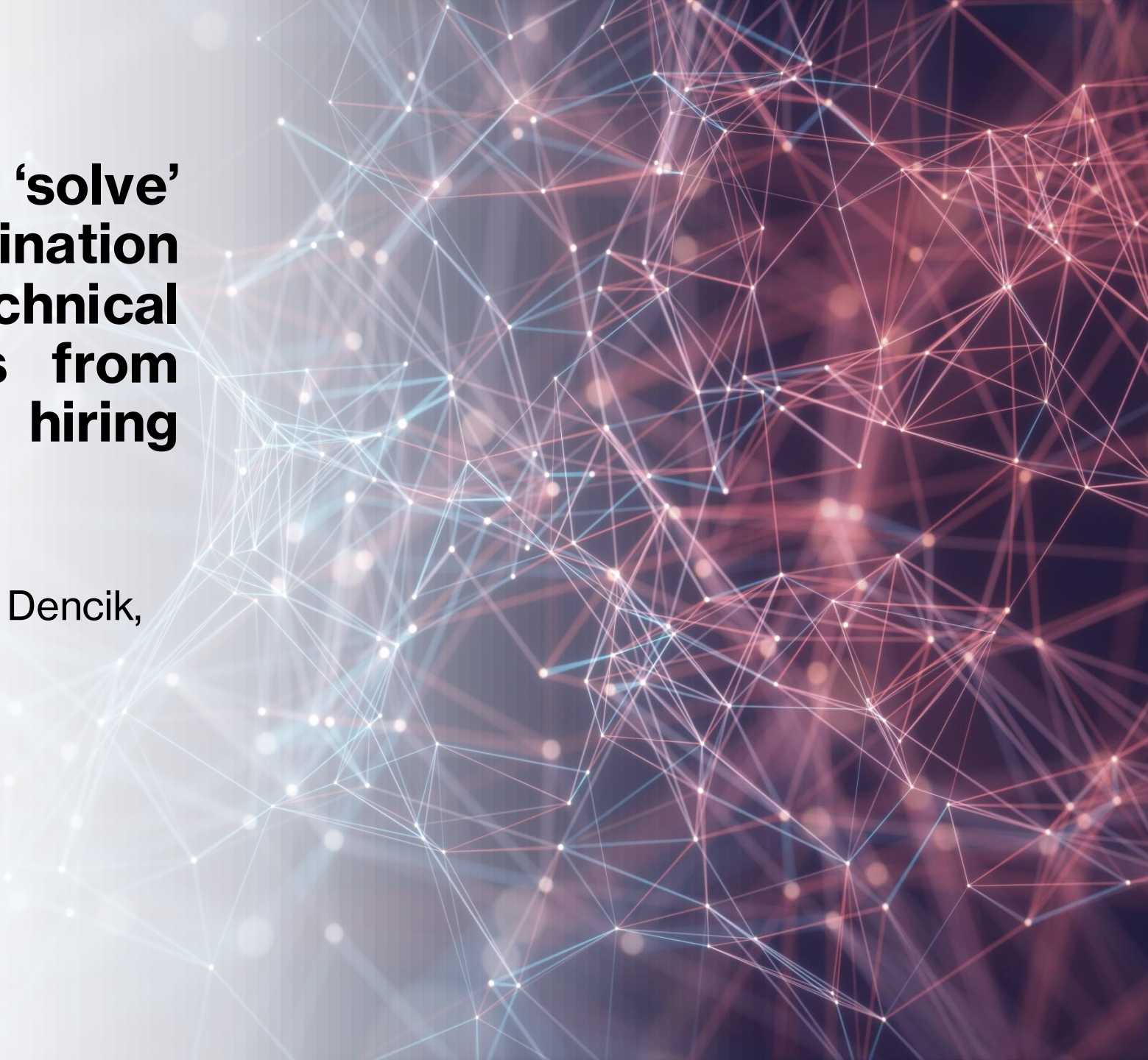
02/12/2020



Automated Hiring Systems (AHSs) - Concerns

- Fairness
- Accountability
- Transparency
- Models analysed – Pymetrics, HireVue, Applied
- Rarely scrutinized/ based on US socio-legal perspective
- Lack of information about how the algorithm works

Models

- **Pymetrics**
  - Conducts games tests – generates metrics of cognitive, social and emotional traits.
  - Unsupervised learning clustering algorithm
  - Follows 4/5th rule of Equal Employment Opportunity Commission (US)
- **HireVue**
  - Games and questions based on Industrial Organization psychology research.
  - Applies 4/5th rule and trains the model until there is no bias detected.
  - Applies clustering methods to detect protected groups.
  - Proposes to replace the objective function, typically a global sum of squared errors, with a corrected function that sums the separate error of the model for each protected group.
  - Proposes to sum a penalty term to the corrected error to account for the regulations
- **Applied**
  - Specialised in promoting diversity and inclusion in recruitment.
  - Numerical, analytical and problem solving platform - Mapped

Contributions

- Proposes to compare the previously rejected candidates to give better statistics of best fit candidates wrongly rejected.
- Points out that all the categories depend on clear definitions of groups.
- In HireVue - adding many terms to functions will decrease the influence of each term, causing convergence problems in the learning algorithm.
- Creates awareness and brings up a the topic for further research.

Limitations

- The study is done based on publicly available data - information relating to code, data sets, features design, trained models, or even the application user interface was not possible
- The study states that algorithm to find the best fit based on the existing employees brings in bias - but without access to the source code or training model, it is not clear whether it can bring in biased groups.
- Number of models used for the study is comparetively less.

eKTELO

- A Review

Challenges – Differentially Private Algorithms

1. Difficulty of designing utility-optimal algorithms: i.e., algorithms that can extract the maximal accuracy given a fixed “privacy budget.”
2. The tasks in which practitioners are interested are diverse and may differ from those considered in the literature.
3. Correctly implementing differentially private algorithms can be difficult - There are known examples of algorithm pseudocode in research papers not satisfying differential privacy as claimed.

eKTELO - Design Principles & Framework

- Expressiveness
- Inbuilt privacy - use of a *Protected Kernel*
- Algorithms expressed as *Plans*
- *Operators* – Figure 1
- Transparency
- Modularity
- Flexibility
- Use cases
  - Census data
  - Naïve Bayes

Transform	
TV	T-Vectorize
TP	V-SplitByPartition
TR	V-ReduceByPartition

Inference	
LS	Least squares
NLS	Nneg Least squares
MW	Mult Weights
HR	Thresholding

Partition selection	
PA	AHPpartition
PG	Grid
PD	Dawa
PW	Workload-based
PS	Stripe(attr)
PM	Marginal(attr)

Query	
LM	Vector Laplace

Query selection	
SI	Identity
ST	Total
SP	Privelet
SH2	H2
SHB	HB
SG	Greedy-H
SU	UniformGrid
SA	AdaptiveGrids
SQ	Quadtree
SW	Worst-approx
SPB	PrivBayes select

Figure 1: The operators currently implemented in ϵKTELO. Private operators are red, Private→Public operators are orange, and Public operators are green.

Contributions of εKTELO

- Every plan implemented in εKTELO comes with a proof of privacy
  - Isolates privacy critical functions in operators.
  - Reduces the amount of code that needs to be verified for privacy
- Improvements to the state-of-art:
  - a general-purpose, efficient and scalable inference engine
  - a new dimensionality reduction operator
  - empirically lowers error
- Operator-based approach:
  - Modularity
  - Transparency
  - Flexibility

Limitations of eKTELO

- εKTELO currently handles only programs that use linear queries on single tables
- JOIN operator is not yet supported.
- Frainess in case of Private->Public operator where privacy budget is utilized.

Thank you!