

Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our [Editorial Policies](#) and the [Editorial Policy Checklist](#).

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a Confirmed

- | | | |
|-------------------------------------|-------------------------------------|--|
| ☐ | ☒ | The exact sample size (n) for each experimental group/condition, given as a discrete number and unit of measurement |
| ☐ | ☒ | A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly |
| ☐ | ☒ | The statistical test(s) used AND whether they are one- or two-sided
<i>Only common tests should be described solely by name; describe more complex techniques in the Methods section.</i> |
| ☒ | ☐ | A description of all covariates tested |
| ☐ | ☒ | A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons |
| ☐ | ☒ | A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals) |
| ☒ | ☐ | For null hypothesis testing, the test statistic (e.g. F , t , r) with confidence intervals, effect sizes, degrees of freedom and P value noted
<i>Give P values as exact values whenever suitable.</i> |
| ☒ | ☐ | For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings |
| ☒ | ☐ | For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes |
| ☒ | ☐ | Estimates of effect sizes (e.g. Cohen's d , Pearson's r), indicating how they were calculated |

Our web collection on [statistics for biologists](#) contains articles on many of the points above.

Software and code

Policy information about [availability of computer code](#)

Data collection	We did not use software to collect data.
Data analysis	The analyses reported in this study used the statistical software R version 4.4.2. We also used the R package ggplot2 version 3.5.1 and pracma version 2.4.4 for creating visualizations. The entire codebase utilized in this manuscript is publicly available under the Apache License on the following GitHub repository: https://github.com/ahsen1402/delegation_project .

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio [guidelines for submitting code & software](#) for further information.

Data

Policy information about [availability of data](#)

All manuscripts must include a [data availability statement](#). This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our [policy](#)

The synthetic data used to create Figure 1 and the associated results can be generated using the code in our GitHub repository, hosted at https://github.com/ahsen1402/delegation_project. The Digital Mammography DREAM Challenge data used to create Figure 2 and associated results are available under restricted access due to their sensitive nature. The data use agreement that allowed us to use the data for the DREAM Challenge explicitly states that the data cannot be

redistributed in total or in parts. The data can be accessed through a request to the data providers, Kaiser Permanente (KP) Washington. Access to KP Research Data resources by non-KP researchers requires collaboration with a KP researcher, who can help refine the phenotype of interest. The KP Research Bank hosts data and analytic tools in a secure analytic platform that is managed by KP. Researchers will be given access to this platform to perform analyses. The website to apply for access is <https://researchbank.kaiserpermanente.org/for-researchers/apply-for-access/>.

Research involving human participants, their data, or biological material

Policy information about studies with [human participants or human data](#). See also policy information about [sex, gender \(identity/presentation\), and sexual orientation](#) and [race, ethnicity and racism](#).

Reporting on sex and gender	Our study is on mammography screening conducted on women. Moreover, we do not use or refer to any sex or gender related factors in our study.
Reporting on race, ethnicity, or other socially relevant groupings	Not Applicable to our study
Population characteristics	This study uses algorithmic risk scores associated with mammography images which do not use population characteristics.
Recruitment	Not Applicable to our study
Ethics oversight	Not Applicable to our study

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☐ Life sciences ☒ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see [nature.com/documents/nr-reporting-summary-flat.pdf](https://www.nature.com/documents/nr-reporting-summary-flat.pdf)

Behavioural & social sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	We develop a quantitative numerical simulation model to back-test our proposed technique. The simulation model uses two data sources as parameters: 1) estimates from the medical literature based on large-scale multi-site studies examining mammography practice in the US, and 2) predicted risk scores from the Digital Mammography DREAM (Dialogue on Reverse Engineering Assessment and Methods) Challenge. The details are provided in the publication https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7052735/
Research sample	We have added a section under methods describing the data set and its source. We are using predictions from different algorithms and do not have access to demographic information. We are using 25,657 Risk scores estimated by 18 algorithms developed during Digital Mammography Dream Challenge. We have only used the validation set data. The details are provided in the publication https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7052735/
Sampling strategy	We do not have a sampling procedure hence not applicable. We use synthetic data and existing validation data from the algorithmic crowdsourcing challenge with no exclusion.
Data collection	The data that is used in this study are predictions from different algorithms so this request is not applicable
Timing	We use the data generated during the DM mammography challenge which was hosted between November 2016 and November 2017.
Data exclusions	No data is excluded
Non-participation	No participants are involved, our study uses existing data created during an algorithmic crowdsourcing challenge.
Randomization	There is no lab/field experiment involved in our study hence not relevant.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involvement in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☒	☐ Clinical data
☒	☐ Dual use research of concern
☒	☐ Plants

Methods

n/a	Involvement in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Plants

Seed stocks	NA
Novel plant genotypes	NA
Authentication	NA