

Portland District Health Clinical Decision Support



PORTLAND
DISTRICT HEALTH

cohorti
machine learning for humans

Winners of:



Australian Government
Department of the Prime Minister and Cabinet

DataStart
Open Gov Data Program

&

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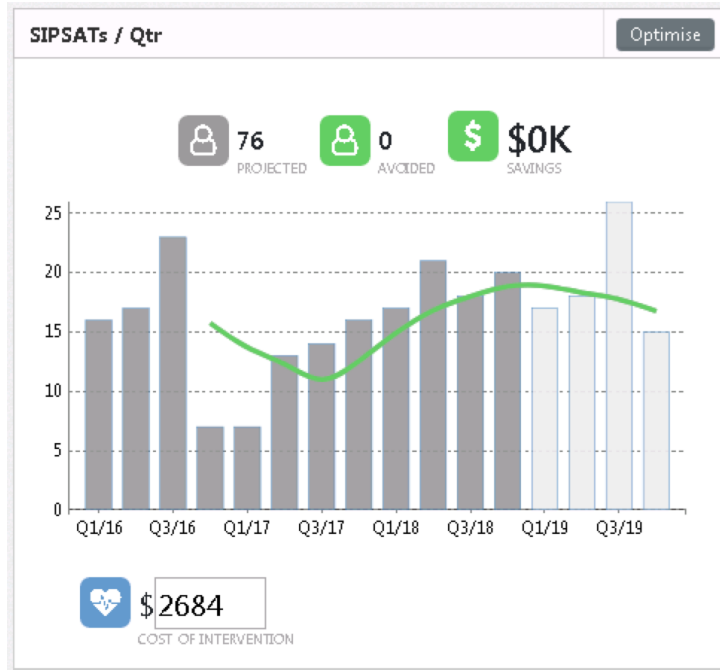


A DataStart 2016 company



SIPSAT patients are expensive and impact outcomes

(Short In-patient Stay & Ambulance Transfer)



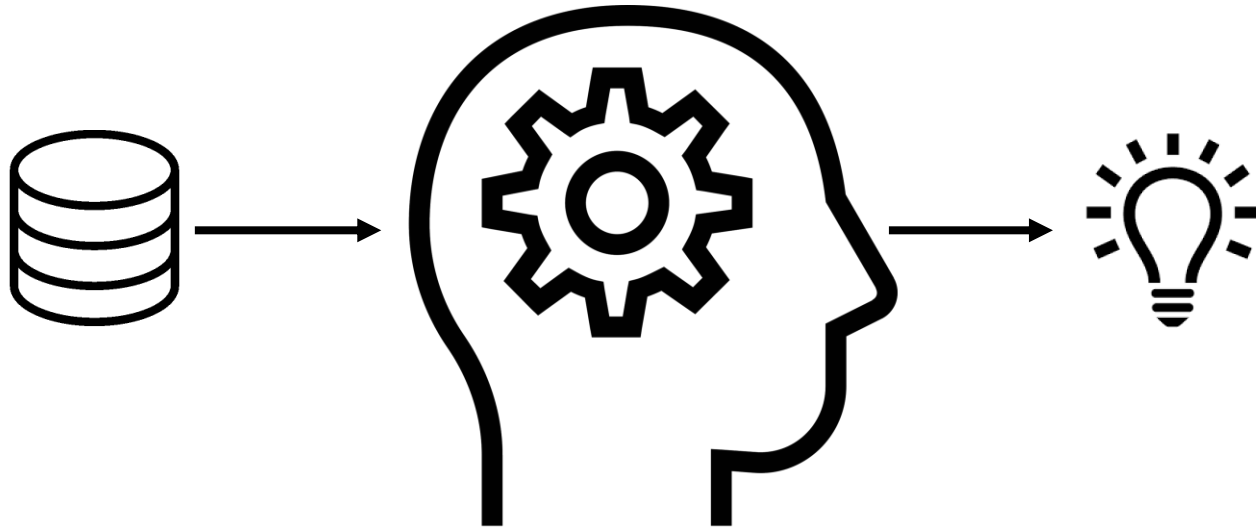
Negative patient outcomes¹
Higher risk of critical transfer²
Increased costs for PDH

¹ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1029903/pdf/archdisch00567-0015.pdf>

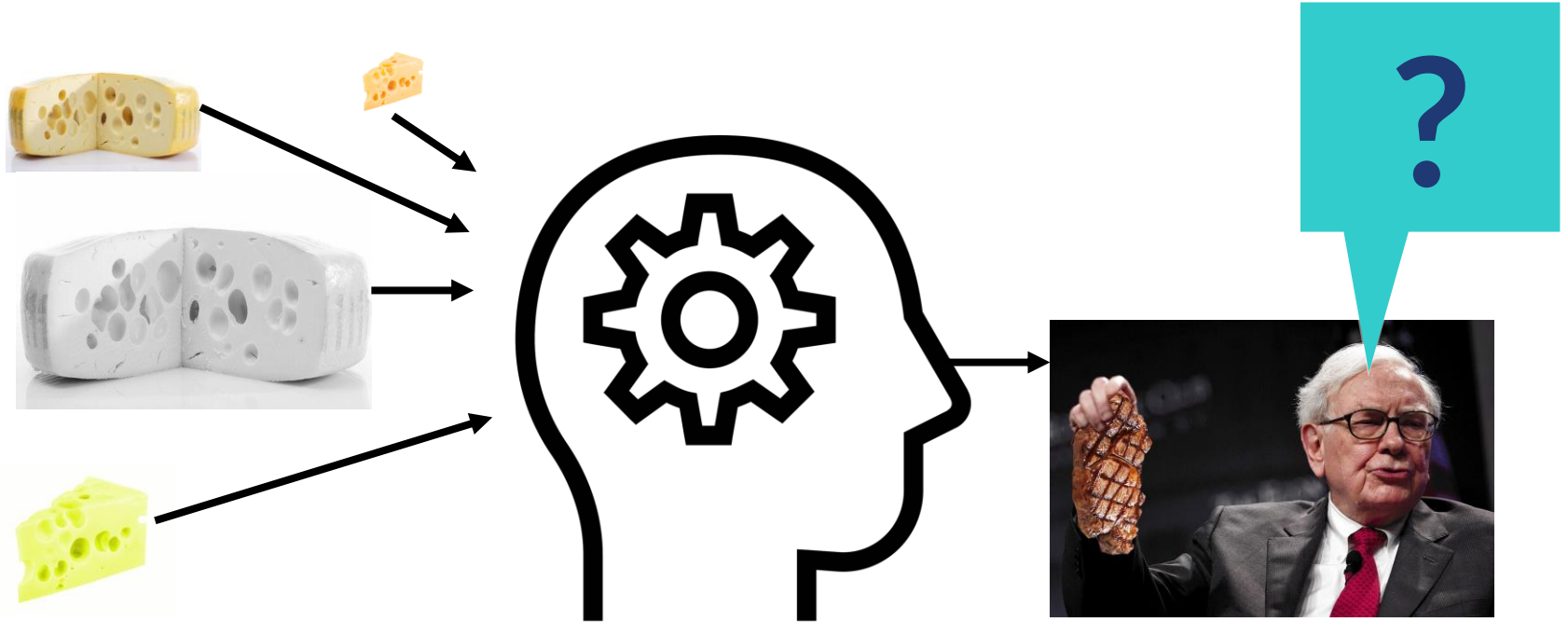
² <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3950432/>



ML does not provide actionable insights



ML needs stakeholder buy in to create value

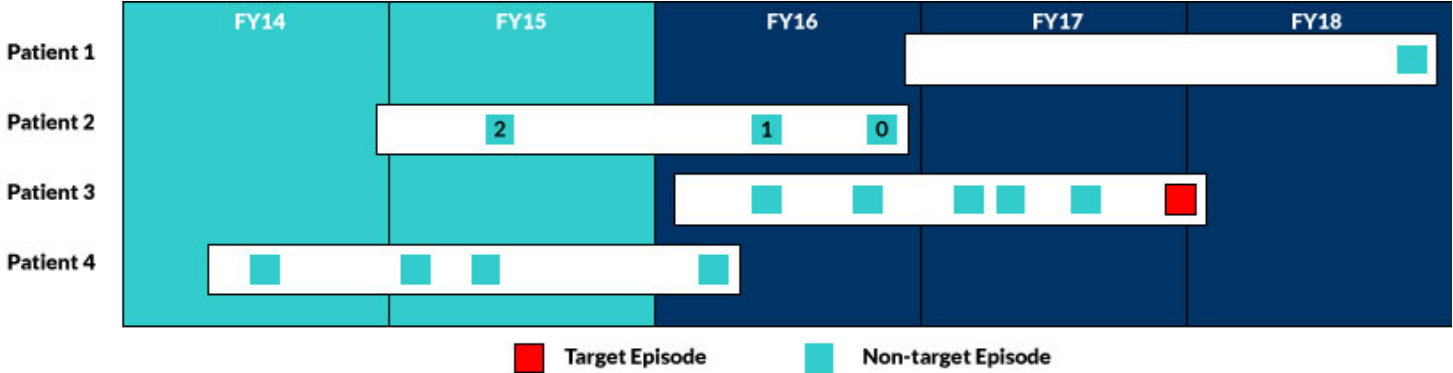


Lots of work.



Don't cherry-pick data

16 tables / 1M rows / 1861 fields \longrightarrow 1 table / 52K rows / 362 fields



Hypothesis 1

*“Machine learning trained on existing TRAK (PAS) data creates models that **lead to actionable insights.**”*

Hypothesis 2

*“Such models can provide **realtime decision support** in a clinical setting to improve KPI trends.”*



Hypothesis 1: A model leads to *actionable insights*

False



Knowing model features doesn't build trust

\$22K savings / quarter

E1: Discharged to ward not elsewhere described

E0: Current ward

E9: Proxy for age

Retrospective_Ex_model
MRADM_DischClassif_DR 39 E1
PAPER_FamilyDoctor_DR 2023 E9
PAADM_CurrentWard_DR 88 E0
PAADM_AdmCateg_DR 29 E0
PAPMI_DOB::-:PAADM_UpdateDate E9

E9: particular family doctor

E0: planned multi-day stay

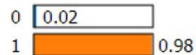
100s more fields



Understanding model decisions doesn't build trust

At least 3 episodes in timeline

Prediction probabilities



Model correctly identifies patient as SIPSAT with 98% probability

Feature	Value
PAADM_AdmDate E2	0.02
PAADM_InpatBedReqDate E1	0.02
MRADM_DischClassif_DR 39.0 E1	0.01
TRANS_Dept_DR 124.0 E1	0.01
PAADM_DischgDate E1	0.01
TRANS_Main Y mean E3	0.01
TRANS_UpdateUserHospital_DR 699 R2 E8	0.00
PAADM_AdmDate E9	0.00
PAPMI_CheckMedicare N E9	0.00
TRANS_EndTime_HourOfDay R5 E8	0.00

Feature Value

Feature	Value
PAADM_AdmDate E2	7864518937.00
PAADM_InpatBedReqDate E1	-7872.00
MRADM_DischClassif_DR 39.0 E1	1.00
TRANS_Dept_DR 124.0 mean E1	0.12
PAADM_DischgDate E1	-11160.00
TRANS_Main Y mean E3	0.33
TRANS_UpdateUserHospital_DR 699 R2 E8	1.00
PAADM_AdmDate E9	7863204600.00
PAPMI_CheckMedicare N E9	1.00
TRANS_EndTime_HourOfDay R5 E8	21.00

E1: Time between IP bed request and first order being entered

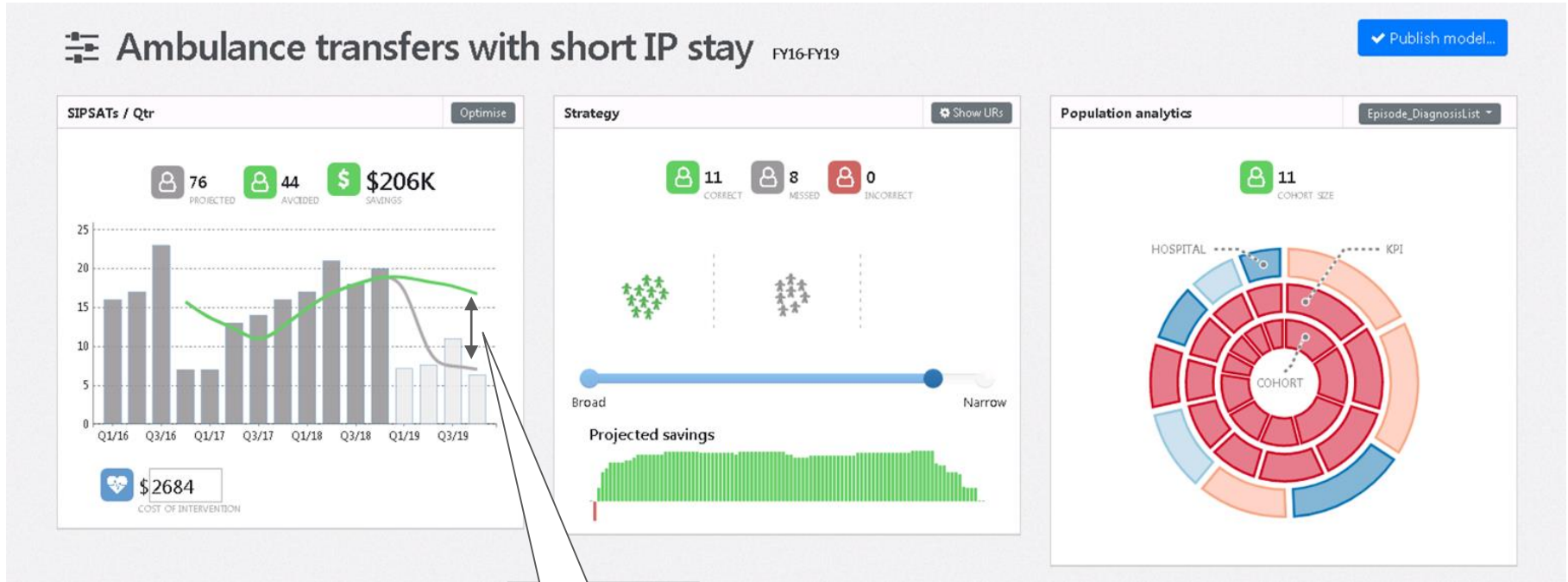
E1: Admitted to ward not elsewhere described

E1: Health Services Centre at PDH used for 12% of episode transactions

E1: LOS



Trust ultimately comes from deploying a model



Trust



Hypothesis 2: Real-time decision support

Maybe



Our model trained using daily data is performant

Retrospective Model: \$22K savings / quarter

Daily E0 Model: \$17K savings / quarter

Daily E1 Model: \$17K savings / quarter



Next Steps: Deploy model trained on realtime data



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Supporting slides



LIME example - Correctly identified as NOT SIPSAT

E3: Time between the episode being created and the patient being put on a wait list

At least 3 episodes in timeline

E8: Temporal difference between Medicare expiry date an Estimated Discharge Date

E1: Temporal difference between the episode creation and patient admission

E7: An order was created at 3pm

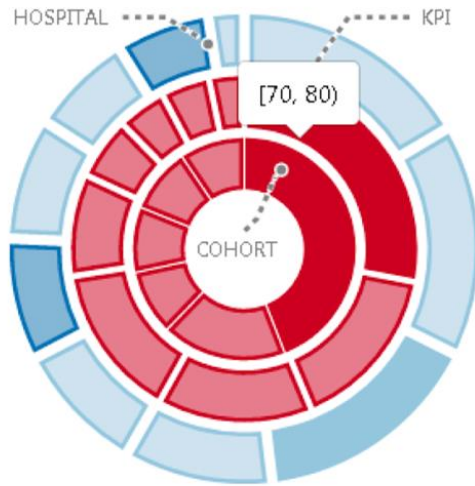
Prediction probabilities



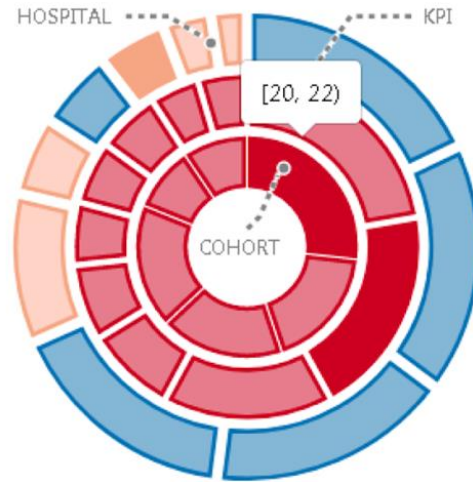
	0	1	Value
PAADM_CreateDate:-...	0.03		PAADM_CreateDate:-WL_DateOfList E3 -51533.00
PAADM_AdmissionDate E2	0.02		PAADM_AdmissionDate E2 7854744360.00
PAPMI_MedicareExpDate:-PAADM_EstimDischargeDate E8	0.01		PAPMI_MedicareExpDate:-PAADM_EstimDischargeDate E8 0.00
PAADM_AdmissionDate:-PAADM_CreateDate E1	0.01		PAADM_AdmissionDate:-PAADM_CreateDate E1 -1897173.00
OEORD_Time_HourOfDay E7	0.01		OEORD_Time_HourOfDay E7 15.00
TRANS_Main Y mean E3	0.01		TRANS_Main Y mean E3 0.00
PAPMI_MedicareExpDate:-PAADM_AdmissionDate E8	0.00		PAPMI_MedicareExpDate:-PAADM_AdmissionDate E8 -92299788.00
MRADM_BaseWIES num E7	0.00		MRADM_BaseWIES num E7 2.20
PAPMI_UserUpdate 7046.0 E8	0.00		PAPMI_UserUpdate 7046.0 E8 1.00
MRCID_AgeCheckType IDR 2.0 sum E6	0.00		MRCID_AgeCheckType IDR 2.0 sum E6 1.00



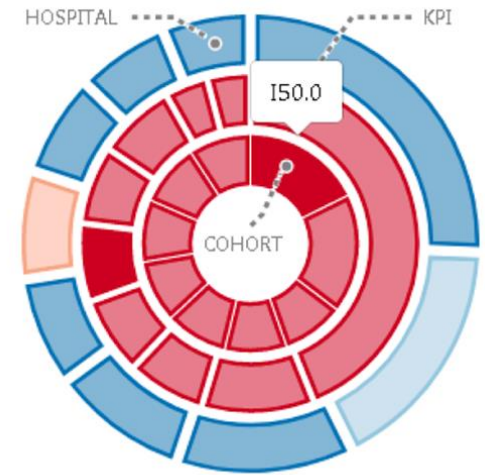
Our cohort: Old, admitted late, cardiac



Age



Admission Hour



Principal Diagnosis

