IRS Office of the Chief Procurement Officer

Analytics, Research, & Technology Division

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Using Data Analytics to Detect Bridge Contracts

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The content of this presentation is the opinion of the writers and does not necessarily represent the position of the Internal Revenue Service.

Bridge Contract Actions

New contract awards are sometimes delayed

Long PALT; bid protests, complexity of contracting process; budget uncertainties; lack of advance planning; workloads; inexperience, & turnover, (GAO, 2014; GAO, 2016).

Bridge Contracts = "an extension to an existing contract beyond the period of performance (including option years), or a new, short-term contract awarded on a sole-source basis to an incumbent contractor to avoid a lapse in service caused by a delay in awarding a follow-on contract" (GAO, 2016, p. 4).

Differing definitions – not defined in the FAR

What's the Problem?

While meeting mission needs, bridge contracts: reduce competition, increase prices, increase transaction costs (GAO, 2016), and delay or deny business opportunities to "out" suppliers

Undersecretary of Defense (AT&L): 1,100 bridge contracts ($13.7B) awarded during 2015 (Longo, 2020).

Sometimes, bridges are bridged

But, really don't know how many bridge actions there are across the federal government

No uniform mechanism to assess the frequency of bridge actions – not reported in FPDS-NG

Using Data Analytics to Detect Bridge Contracts

Develop a data-analytic methodology – using natural language processing, graph network theory, and machine learning – to reliably identify bridge contract actions.

RQ1: How prevalent are bridge contracts?

RQ2: Are there any discernable patterns in bridge contract use?

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Methodology

Natural language processing (NLP) to prepare the data.

Represented actions as nodes in a network, with edges connecting related actions.

2 machine learning algorithms via random forest regression to predict likely bridge actions (50 decision trees each)

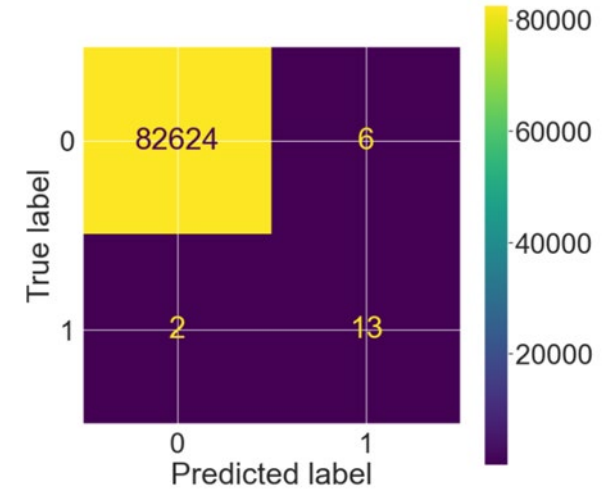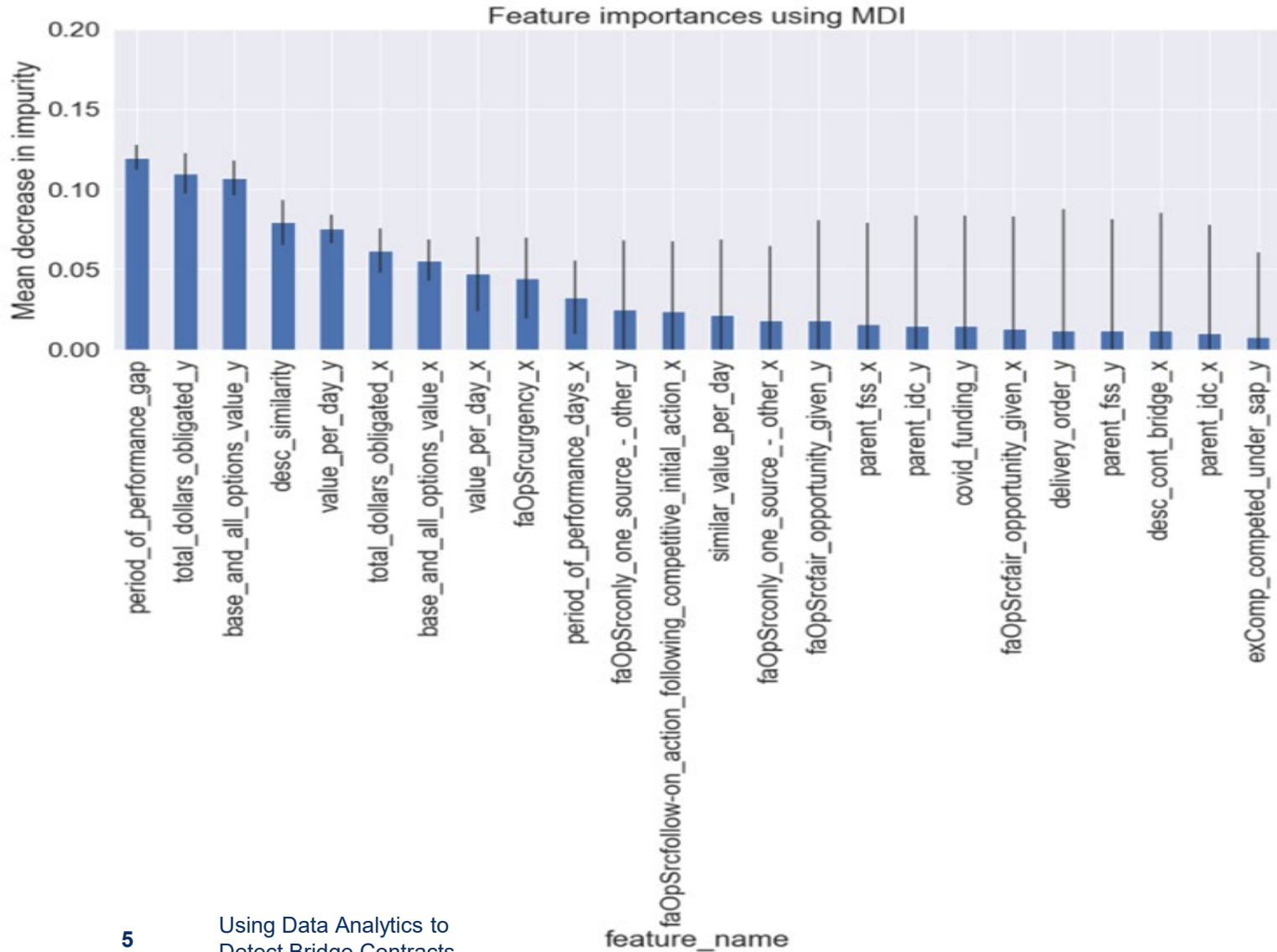USASpending data: > 5M contract actions, FY10-FY22

IRS contract documents (e.g., J&As) + FY 21 Navy bridge contract report were used as ground truth to assess the model.

✓ Model precision = True Positives / (True Positives + False Positives).

Assumptions: (1) A bridge contract will have the same vendor name, funding office, and be chronologically sequential. (2) bridge mods share a PIID and modifications can be ordered by their action date, with ties being broken by modification number.
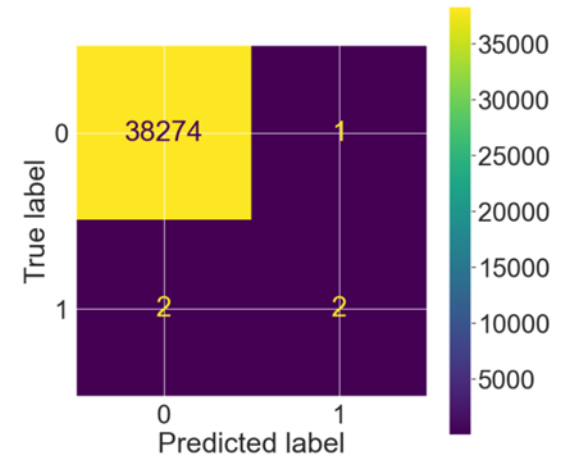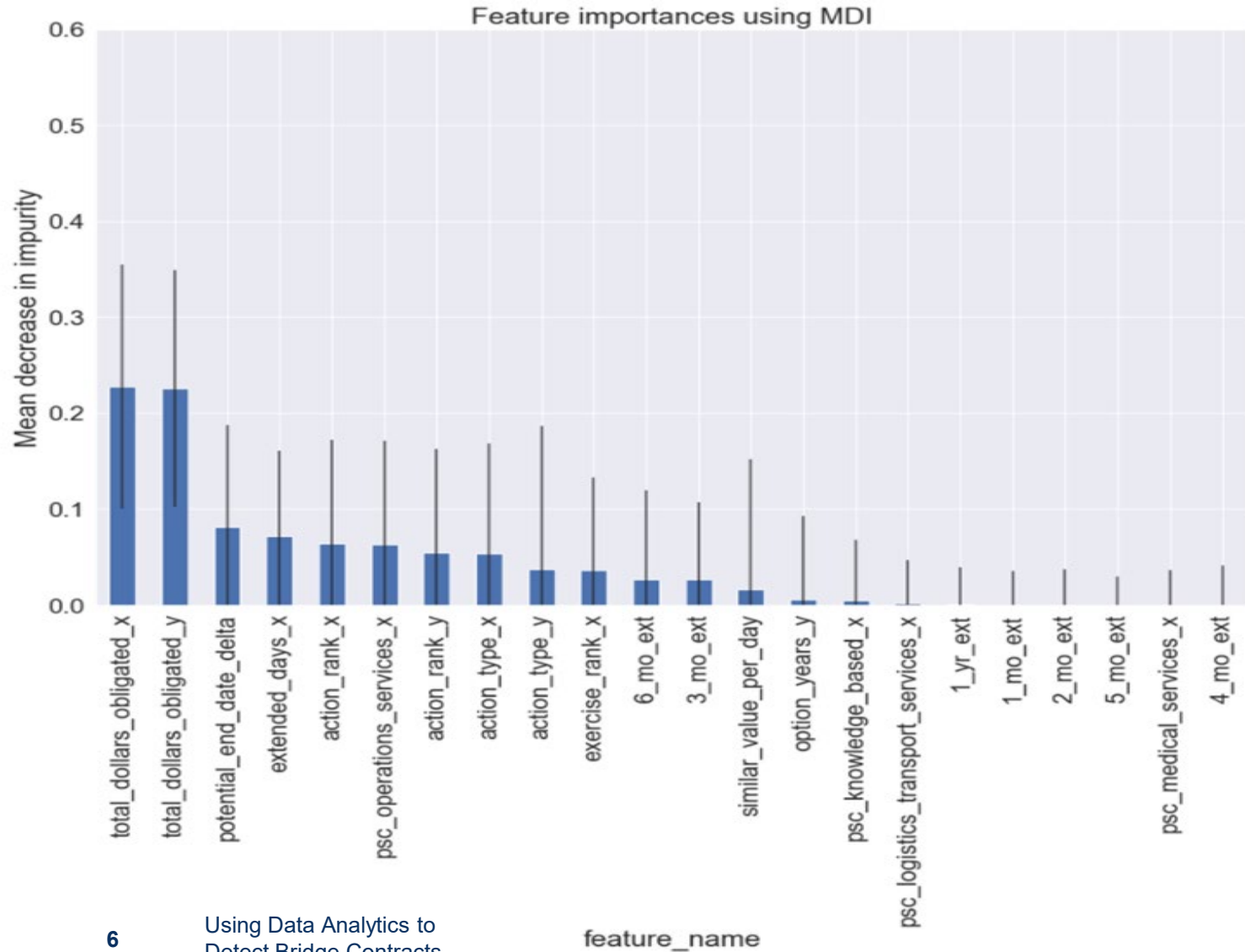
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Bridge Contracts - Mean Decrease in Impurity

Confusion Matrix: Precision=.684, Recall=.868

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Feature importances using MDI

Confusion Matrix: Precision=.667, Recall=.5

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Key Findings & Implications

Advanced analytics techniques are helpful, but not perfect, in detecting bridge contracts – only discovered 15 bridges (mostly contracts vs mods)

The most predictive features of bridge contracts include (in order of predictive power): The period of performance gap between the predecessor and bridge contract action, the base and all options value, dollars obligated, similarity in the award descriptions, a consistent value per day among the predecessor and bridge contract action, urgency, period of performance days, competition codes in FPDS, and COVID funding.

The most predictive features of bridge modifications include (in order of predictive power): dollars obligated, potential end date, action rank, services, action type, exercise rank, six or three month extension, similar value per day, option year, knowledge-based services, and logistics and transportation services.

Documents (e.g., J&As) should identify bridge actions.

Contract file should report prior extensions and identify the original contract extended.

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