

Mine Now

Future of Mineral Exploration
through Machine Learning



Mining & Australia



1800's

Discovery of
the first
Coal Mine

The period
of Gold
Rush

1850's



1960's

Resource boom
and international
recognition

77 B\$ or 5.6 %
of Australia's
GDP

2019



The Need for New Mineral Exploration Methods -



Already Discovered

Most outcropping deposits have already been discovered.



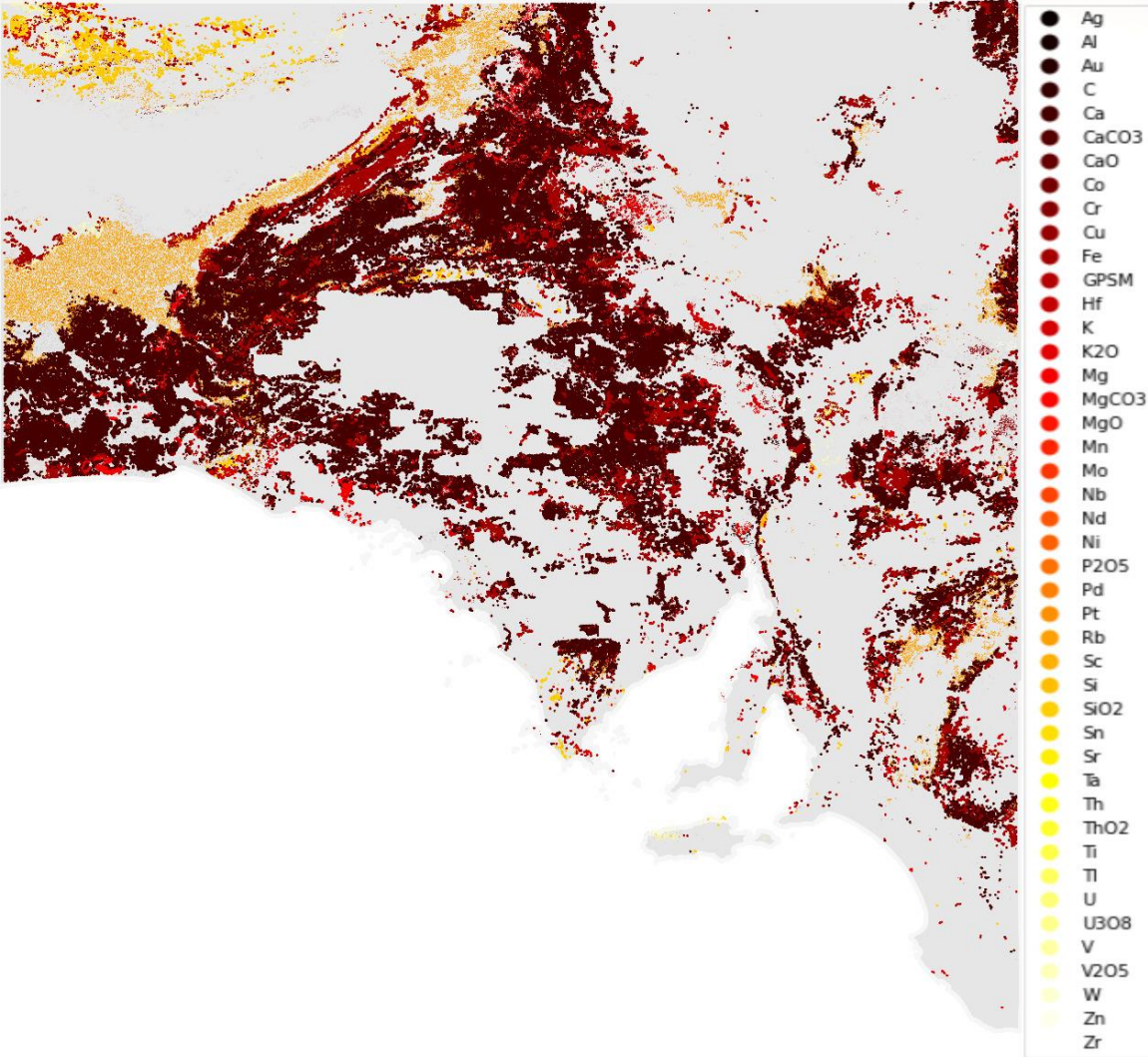
Drying Out

Mature Mining Camps are starting to dry out.

What If?

I could tell you more around **340,000** Novel
Mineralization

I'm telling the
truth!



341,802

New Mineralized
Points

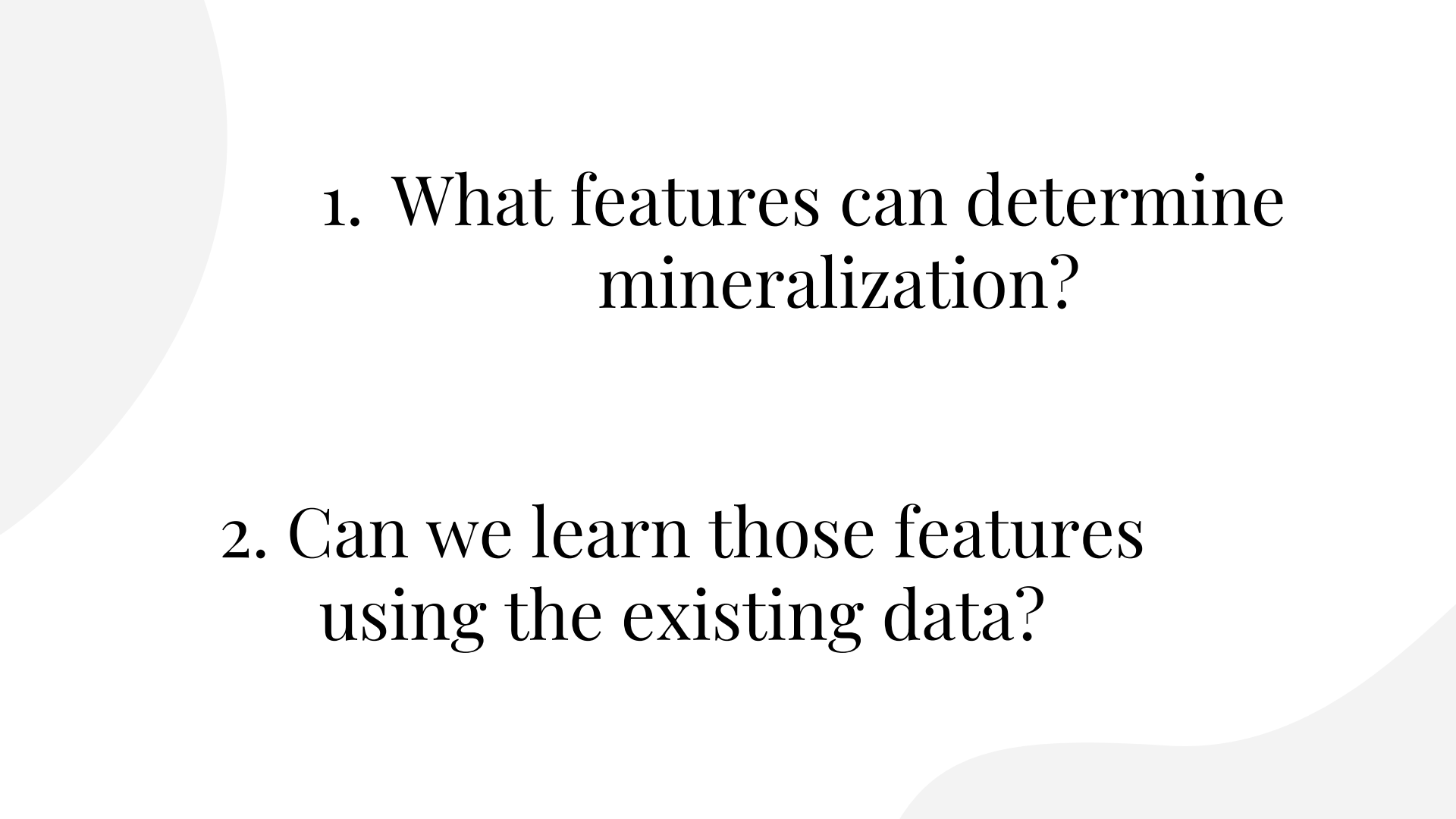
200 Billion \$ +

Worth of Minerals

41 Minerals

Including Precious
minerals such as Au, Ti, V,
Tl, & U₃O₈

Let's See the
Magic!

- 
1. What features can determine mineralization?
 2. Can we learn those features using the existing data?

Two Categories of Data



GeoPhysical

Eg. Gravity, Magnetism, etc. of the whole landmass of Gawler province in the form of rasters.



Geochemical

Comprising of details such as Depth, Mineral Classes, etc. of the already existing mineral locations.

Two Categories of Data



— Features

GeoPhysical

Eg. Gravity, Magnetism, etc. of the whole landmass of Gawler province in the form of rasters.

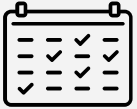


— Label

Geochemical

Comprising of details such as Depth, Mineral Classes, etc. of the already existing mineral locations.

You Could Use Three Columns, Why Not?



Mars

Mars is a cold place. It's full of iron oxide dust, which gives the planet its reddish cast



Jupiter

It's the biggest planet in the Solar System. It was named after a Roman god



Saturn

Yes, this is the ringed one. It's a gas giant, composed mostly of hydrogen and helium

01

‘Wh're Art Thee Min'ral?’

Binary Classifier which predicts
mineralization given the
geophysical features of a location



aml.leaderboard

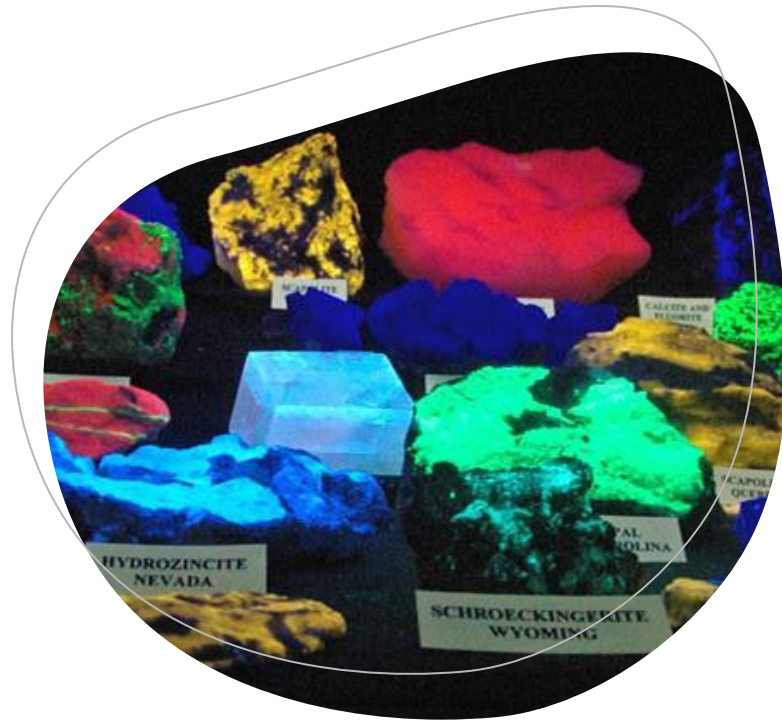
	model_id	auc	logloss	aucpr	mean_per_class_error	rmse	mse
	StackedEnsemble_AllModels_AutoML_20200727_130454	0.977349	0.195728	0.972297	0.0753031	0.237675	0.0564893
	StackedEnsemble_BestOfFamily_AutoML_20200727_130454	0.977349	0.195728	0.972297	0.0753031	0.237675	0.0564893
	DRF_1_AutoML_20200727_130454	0.976129	0.216466	0.970375	0.0769354	0.243678	0.0593789
	XRT_1_AutoML_20200727_130454	0.972935	0.243863	0.965447	0.0804539	0.249788	0.0623942
	XGBoost_2_AutoML_20200727_130454	0.961389	0.263156	0.952788	0.101885	0.277815	0.0771813
	GBM_5_AutoML_20200727_130454	0.949435	0.351741	0.938337	0.120675	0.318762	0.101609
	XGBoost_1_AutoML_20200727_130454	0.947571	0.300069	0.935833	0.12216	0.300862	0.0905181
	XGBoost_grid__1_AutoML_20200727_130454_model_1	0.944831	0.30148	0.931614	0.124733	0.303365	0.0920301
	GBM_4_AutoML_20200727_130454	0.942094	0.349772	0.929859	0.128643	0.32109	0.103099
	GBM_grid__1_AutoML_20200727_130454_model_2	0.92922	0.35629	0.914609	0.146284	0.329473	0.108552

		N	Y	Error	Rate
0	N	125827.0	11894.0	0.0864	(11894.0/137721.0)
1	Y	7564.0	110176.0	0.0642	(7564.0/117740.0)
2	Total	133391.0	122070.0	0.0762	(19458.0/255461.0)

02

‘Bid Me Thy Nameth!’

Multiclass classifier that predicts which mineral would most dominantly be found



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ASSISTANT

DATASET
Train

FOLD COLUMN

TIME COLUMN
[OFF]

TYPE	COUNT	UNIQUE	MOST FREQ
str	363235	80	74446

STATUS: COMPLETE

DEPLOY (LOCAL & CLOUD)

INTERPRET THIS MODEL

DIAGNOSE MODEL ON NEW DATASET...

SCORE ON ANOTHER DATASET

TRANSFORM ANOTHER DATASET...

[DOWNLOAD PREDICTIONS ▼](#)

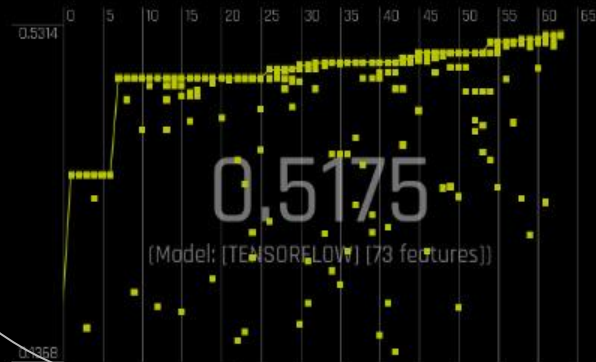
BUILD PYTHON SCORING PIPELINE

[DOWNLOAD MOJO SCORING PIPELINE](#)

VISUALIZE SCORING PIPELINE (EXPERIMENTAL)

[DOWNLOAD SUMMARY & LOGS](#)[DOWNLOAD AUTOREPORT](#)

ITERATION DATA - VALIDATION



▲ ACCURACY CITIES 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039

Click and drag to zoom

ITERATIONS ►

VARIABLE IMPORTANCE



MULTI-CLASS CONFUSION MATRIX

Predicted Label

	Ag	Al	Al2O3	As	Au	Ba	Be	Bi	C	Ca	Total	Error
Ag	4050	0	0	0	1043	0	0	0	0	2236	11773	0.5874%
Al	9	33	0	0	97	0	0	0	0	247	604	0.9590%
Al2O3	0	0	0	0	0	0	0	0	0	2	8	1.0000%
As	0	0	0	0	44	0	0	0	0	12	101	1.0000%
Au	577	1	0	0	40026	0	0	0	0	13439	62679	0.2614%
Ba	1	0	0	0	11	0	0	0	0	19	37	1.0000%
Be	0	0	0	0	2	0	0	0	0	2	7	1.0000%
Bi	0	0	0	0	0	0	0	0	0	4	19	1.0000%
C	0	0	0	0	0	0	0	0	29	7	67	0.5672%
Ca	150	13	0	0	12082	0	0	0	1	45702	74466	0.3850%
Total	10601	90	0	0	76270	1	0	0	54	106651	164067	
Error	0.5502	0.6333	NaN	NaN	0.4752	1	NaN	NaN	0.463	0.5715		0.2949%

Actual Label

ROC P-R LIFT GAINS K-S SUMMARY

True Positive Rate

False Positive Rate

9795 (AUC)

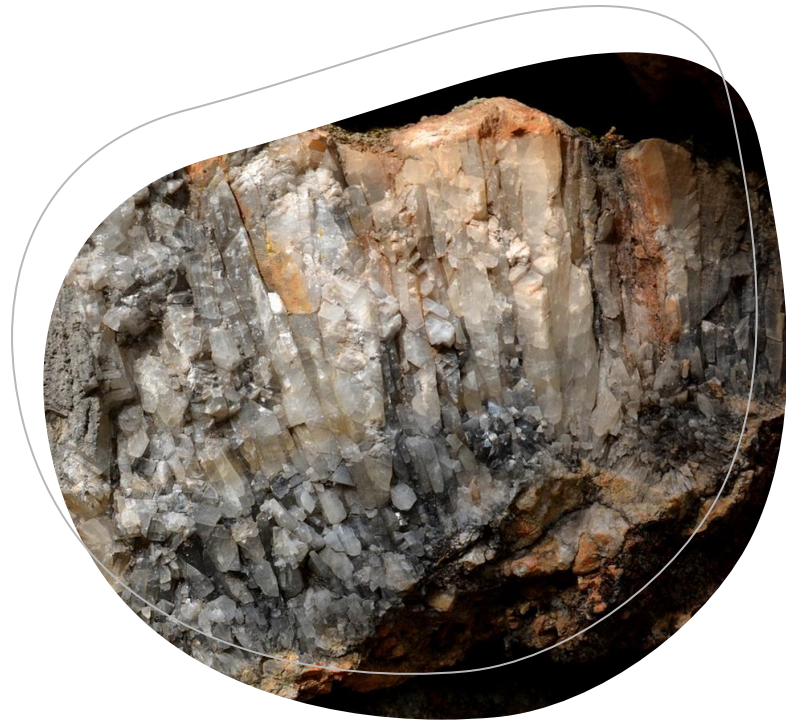
89214.6269	189.9269	
TN	FP	
943.7769	453.1692	
FN	TP	
0.4991	0.0021	0.3244
Threshold	FPR	TPR
0.9875	0.4443	0.4730
Accuracy	F1	MCC

Validation Metrics

03

‘How Big Art Thee’

Multiclass Classifier that predicts
the type of size of the deposit.



H2O.ai Experiment faciseri

DRIVERLESS AI 18.7.2 - AI TO DO AI

Licensed to New Community Lead Account (SN45387 - Evaluation License). Current User -

EXPERIMENT SETUP

ASSISTANT

DISPLAY NAME

faciseri

DATASET

Train

ROWS

363K

COLUMNS

13

DROPPED COLUMNS

5

VALIDATION DATASET

--

TEST DATASET

Yes

Test

TARGET COLUMN

UNIT_PPM_CLASS

FOLD COLUMN

--

WEIGHT COLUMN

--

TIME COLUMN

[OFF]

TYPE

str

COUNT

363235

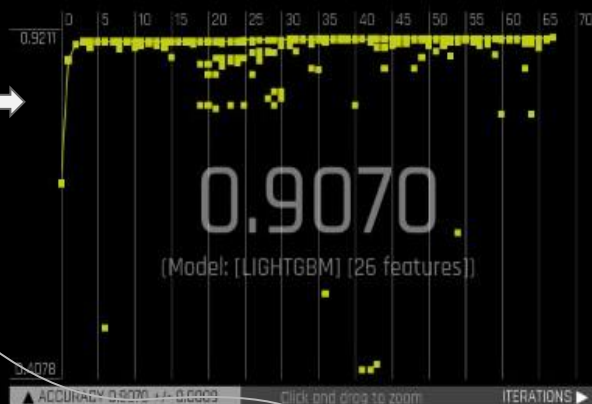
UNIQUE

3

MOST FREQ

153228

ITERATION DATA - VALIDATION



PROJECTS DATASETS AUTOVIZ EXPERIMENTS DIAGNOSTICS MLI DEPLOYMENTS RESOURCES ▼ MESSAGES[2] LOG

STATUS: COMPLETE

DEPLOY (LOCAL & CLOUD)

INTERPRET THIS MODEL

DIAGNOSE MODEL ON NEW DATASET...

SCORE ON ANOTHER DATASET

TRANSFORM ANOTHER DATASET...

DOWNLOAD PREDICTIONS ▼

BUILD PYTHON SCORING PIPELINE

DOWNLOAD MOJO SCORING PIPELINE

VISUALIZE SCORING PIPELINE (EXPERIMENTAL)

DOWNLOAD SUMMARY & LOGS

DOWNLOAD AUTOREPORT

TRAINING SETTINGS

EXPERT SETTINGS

5

ACCURACY

5

TIME

5

INTERPRETABILITY

ACCURACY

SCORER

CLASSIFICATION

REPRODUCIBLE

GPU ENABLED

CPU / MEMORY

Scores Notifications Log Trace

CPU

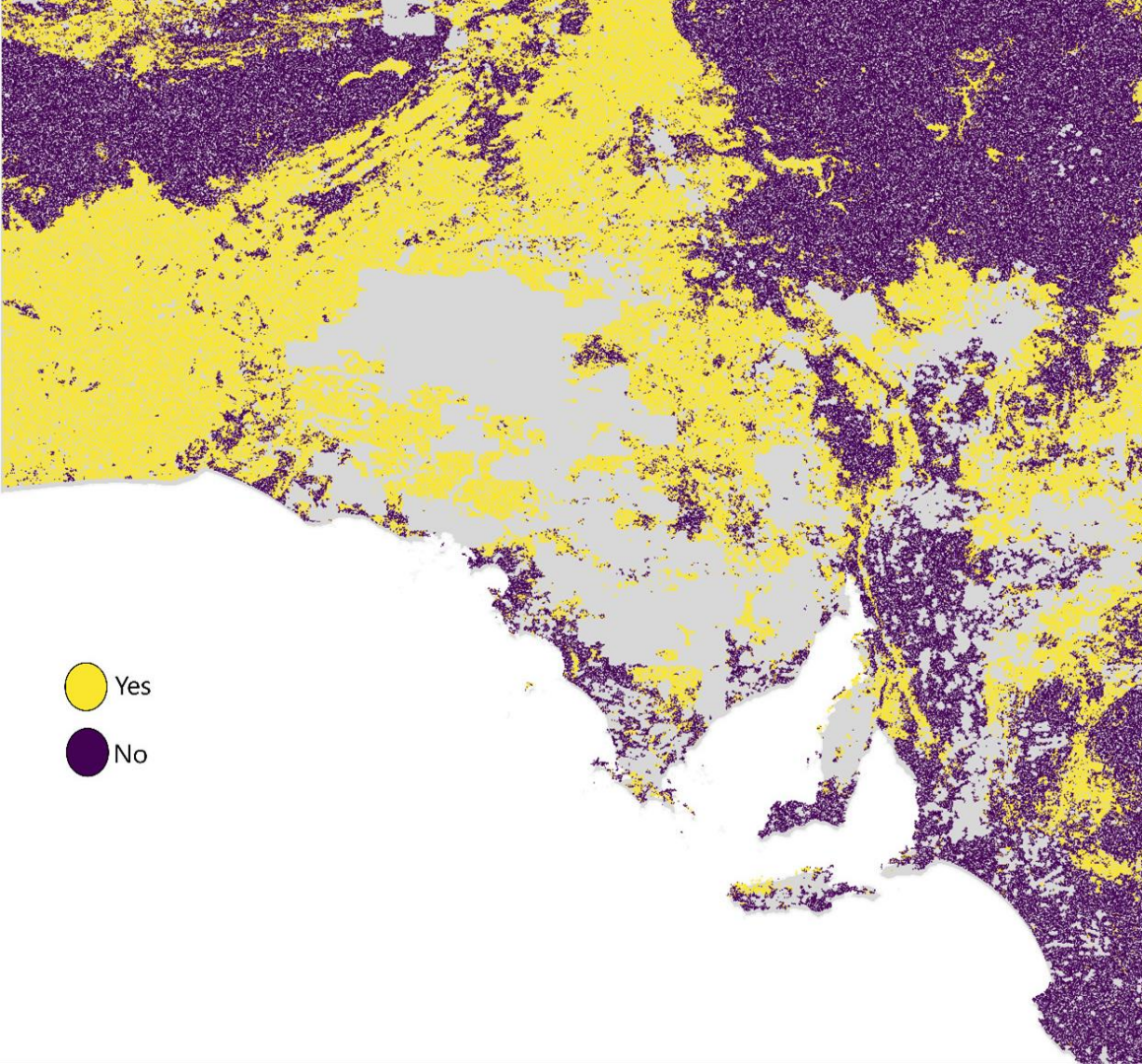
MEM

VARIABLE IMPORTANCE

20_FreqCHEM_CODE	1.00
6_FreqCHEM_CODE	0.52
10_TruncSVD:dem-9sgravity_IVgravity_ma0	0.11
13_TruncSVD:SA_TMI:SA_TMI_VRT:d8-9sgravity_IV...	0.09
13_TruncSVD:SA_TMI:SA_TMI_VRT:d8-9sgravity_IV...	0.09
10_TruncSVD:dem-9sgravity_IVgravity_ma1	0.08
13_TruncSVD:SA_TMI:SA_TMI_VRT:d8-9sgravity_IV...	0.08
17_SA_TMI	0.07
19_TruncSVD:SA_TMI_VRT:d8-9sgravity_ma0	0.07
21_ClusterDist2gravity_IV0	0.05
22_ClusterDist2:SA_TMI:SA_TMI_VRT:d8-9sgravity_IVgravi...	0.05
21_ClusterDist2:gravity_IV1	0.05
22_ClusterDist2:SA_TMI:SA_TMI_VRT:d8-9sgravity_IVgravi...	0.05
19_TruncSVD:SA_TMI_VRT:d8-9sgravity_ma1	0.04

CM ROC P-R LIFT GAINS K-S SUMMARY

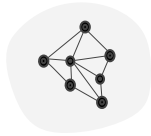




325,000

Total Mineralized Points

Generation of Novel Mineralized Locations



>



>



>



Generation

of novel points
excluding the already
dug locations

Sampling

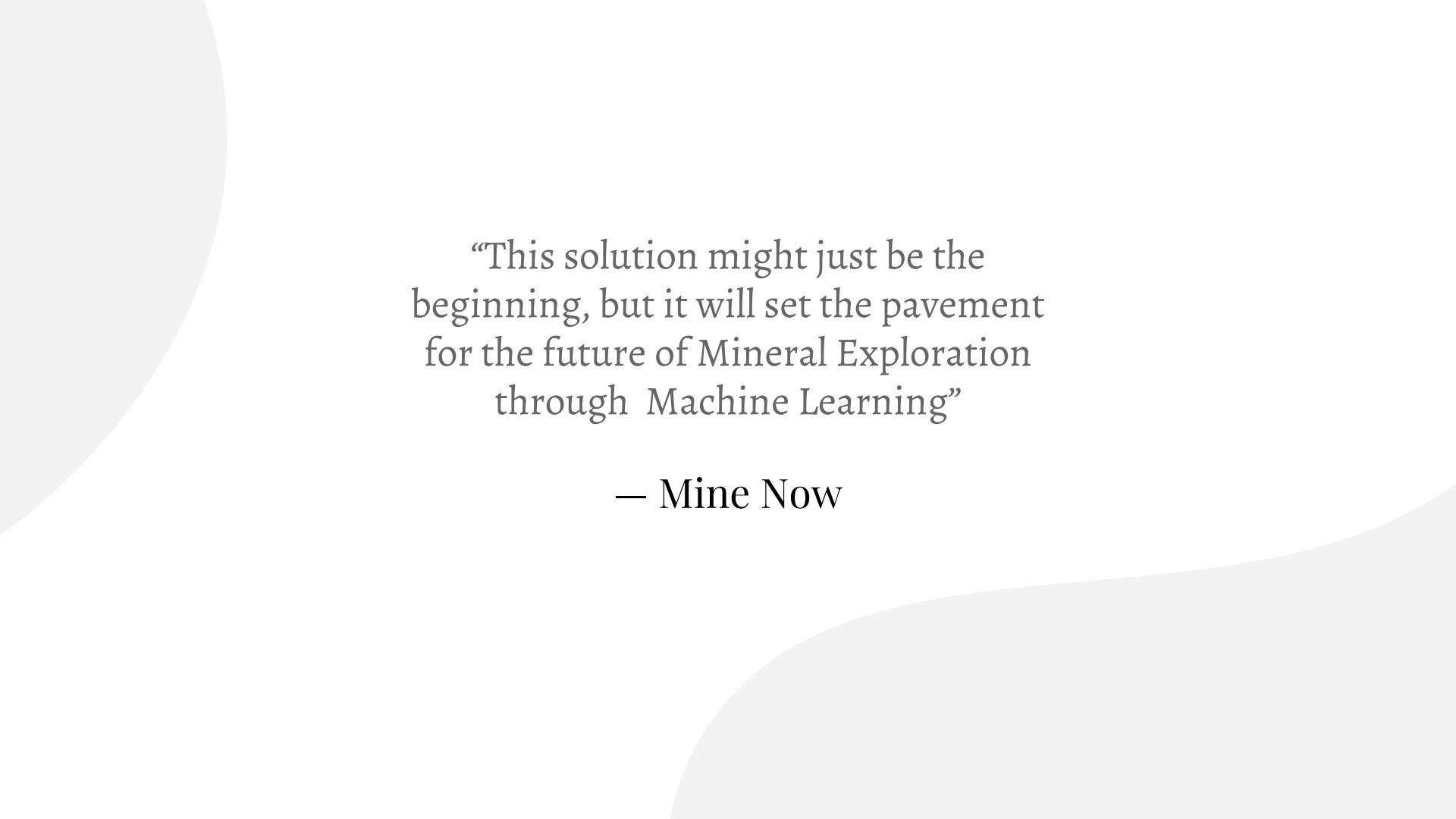
Of geophysical
features of the
generated points

Predictions

By the trained
models on the
sampled data

Analysis

Analysing and
visualising models'
predictions



“This solution might just be the
beginning, but it will set the pavement
for the future of Mineral Exploration
through Machine Learning”

— Mine Now