ELECTRONIC NOSE CLASSIFIERS THAT WORK BEST IN THE LAB ALSO WORK BEST IN THE FIELD

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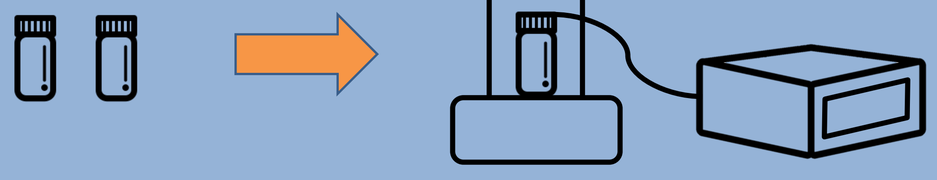
INTRODUCTION:

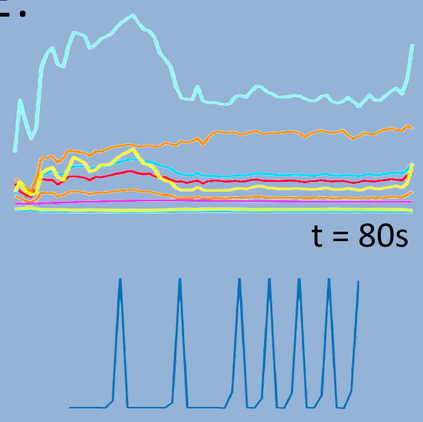
ELECTRONIC NOSES (ENOSES) ARE USED TO "SMELL" VOLATILE ORGANIC COMPOUNDS.

ENOSES PERFORM WELL AT DISCRIMINATORY ODOR TASKS IN CONTROLLED SETTINGS, BUT OFTEN FAIL IN UNCONTROLLED SETTINGS. THERE ARE MANY DIFFERENT SOURCES OF VARIANCE THAT MAY UNDERLIE THIS DIFFERENCE.

OBJECTIVE: WE ASKED WHETHER THE ALGORITHMIC STRATEGY UNDERLIES PART OF THE VARIANCE BETWEEN CONTROLLED AND NOISY SETTINGS. IN OTHER WORDS, GIVEN A SPECIFIC TASK, WE ASKED WHETHER THE BEST-PERFORMING ALGORITHM IN BOTH SETTINGS IS THE SAME.

METHODS





2 MULTICOMPONENT ODORANTS: A (OA)*, B (OB)*, AND BLANK

CONTROLLED SETTING: 10X OA, OB, BLANK IN HTA AUTOSAMPLER & PEN3 ENOSE

UNCONTROLLED SETTING: 30X OA, OB, BLANK IN LIVING ROOM W/ PEN3 ENOSE

ANALYSIS: REDUCE 10 CHANNEL TIME SERIES W/ 3RD DEGREE POLY FIT

*Odorants OA and OB were mixtures of 3 components

ENOSE IS EFFECTIVE AT ODOR DISCRIMINATION TASKS

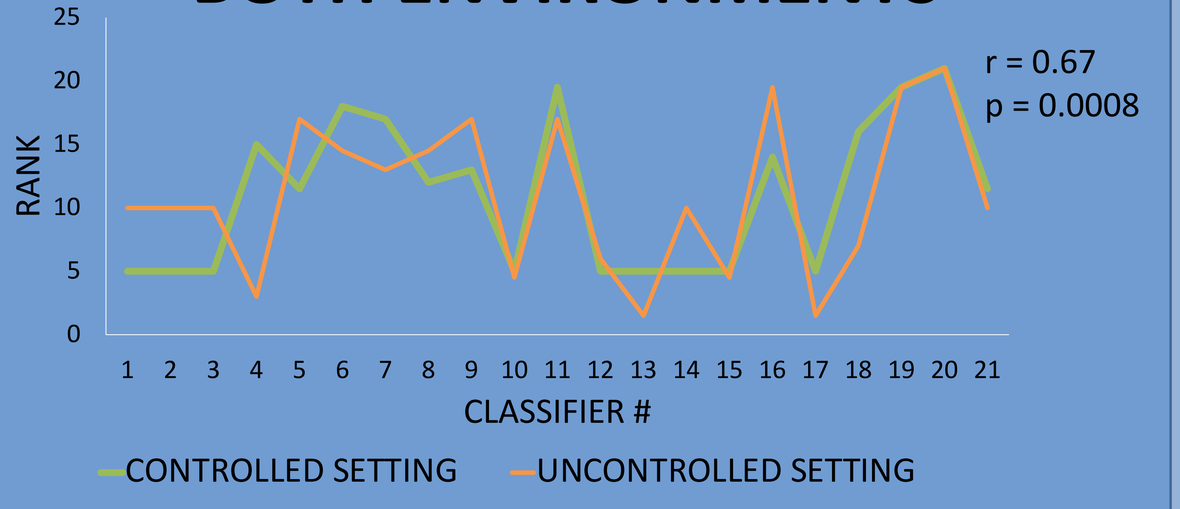
CONTROLLED: **100%** UNCONTROLLED: **82.9%**
LSTM IN UNCONTROLLED: 80%

SUBSPACE DISCRIMINANT CONFUSION MATRIX, 500 ITER

OUTPUT CLASS \ TARGET CLASS	BLANK	OA	OB	
BLANK	**10** 25.0%	**4** 10.0%	**1** 2.5%	66.7% 33.3%
OA	**0** 0.0%	**13** 32.5%	**1** 2.5%	92.9% 7.1%
OB	**0** 0.0%	**0** 0.0%	**11** 27.5%	100% 0.0%
	100% 0.0%	76.5% 23.5%	84.6% 15.4%	**85.0%** **15.0%**

TOP 2 CLASSIFIERS IN BOTH SETTINGS:
SUBSPACE DISCRIMINANT & SUBSPACE KNN

THE SAME CLASSIFIERS WORK IN BOTH ENVIRONMENTS



CONCLUSIONS

THERE WAS HIGH CORRELATION IN CLASSIFIER ACCURACY ACROSS CONTROLLED AND UNCONTROLLED SETTINGS. THIS IMPLIES THAT WE CAN SELECT A CLASSIFIER BASED ON LAB WORK, AND THEN APPLY IT IN FIELD WORK. THE LAB/FIELD DIFFERENCE IN PERFORMANCE IS LIKELY MOSTLY ATTRIBUTED TO OTHER SOURCES OF VARIANCE.

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