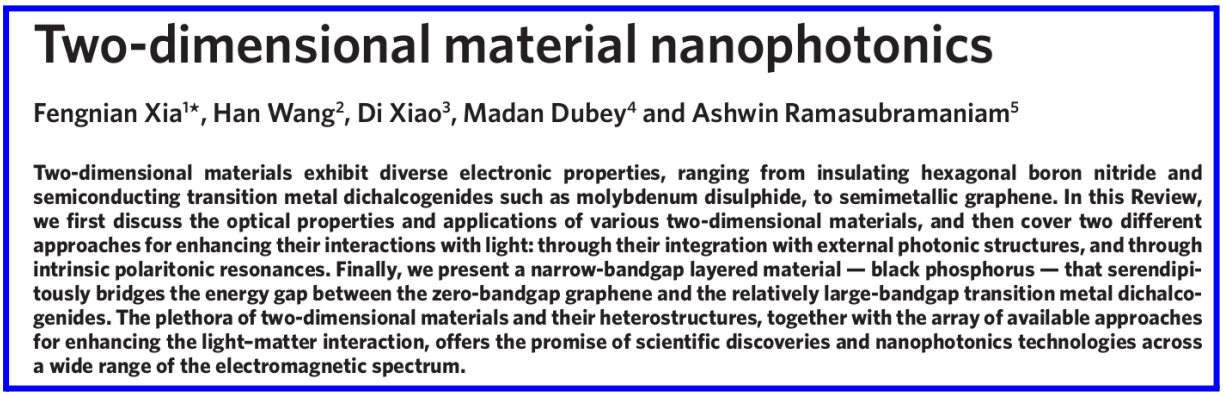
# Fundamental Theory of Intelligent Interaction Systems

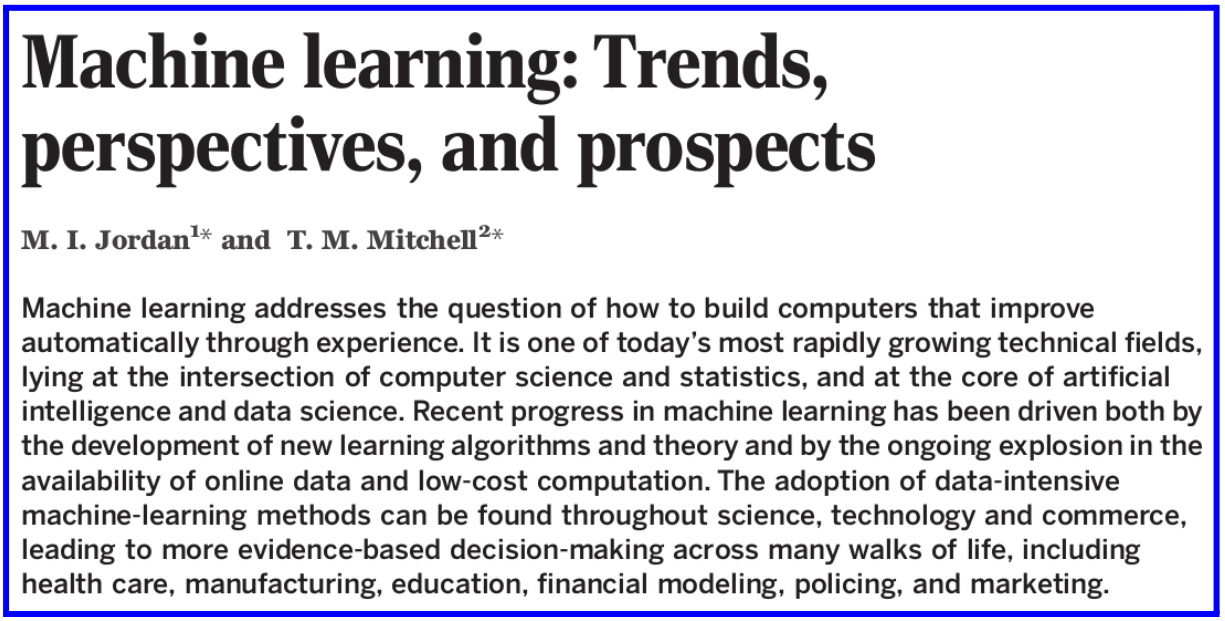
## These are the two articles I prepared



Two-dimensional material nanophotonics

Fengnian Xia[1]*, Han Wang[2], Di Xiao[3], Madan Dubey[4] and Ashwin Ramasubramaniam[5]

Two-dimensional materials exhibit diverse electronic properties, ranging from insulating hexagonal boron nitride and semiconducting transition metal dichalcogenides such as molybdenum disulphide, to semimetallic graphene. In this Review, we first discuss the optical properties and applications of various two-dimensional materials, and then cover two different approaches for enhancing their interactions with light: through their integration with external photonic structures, and through intrinsic polaritonic resonances. Finally, we present a narrow-bandgap layered material — black phosphorus — that serendipitously bridges the energy gap between the zero-bandgap graphene and the relatively large-bandgap transition metal dichalcogenides. The plethora of two-dimensional materials and their heterostructures, together with the array of available approaches for enhancing the light–matter interaction, offers the promise of scientific discoveries and nanophotonics technologies across a wide range of the electromagnetic spectrum.



Machine learning: Trends, perspectives, and prospects

M. I. Jordan[1]* and T. M. Mitchell[2]*

Machine learning addresses the question of how to build computers that improve automatically through experience. It is one of today's most rapidly growing technical fields, lying at the intersection of computer science and statistics, and at the core of artificial intelligence and data science. Recent progress in machine learning has been driven both by the development of new learning algorithms and theory and by the ongoing explosion in the availability of online data and low-cost computation. The adoption of data-intensive machine-learning methods can be found throughout science, technology and commerce, leading to more evidence-based decision-making across many walks of life, including health care, manufacturing, education, financial modeling, policing, and marketing.

One of the articles is related to machine learning and the other is on 2D materials.

```
nb = iitnb.IITNaiveBayses(
"./class3/machine_learning.txt",
"./class3/two_dimensional_materials.txt","eng")
```

```
materials: [[0.03114897 0.96885103]]
Machine learning: [[9.99905217e-01 9.47829016e-05]]

[Done] exited with code=0 in 0.599 seconds
```

Simply tested the "material" and "machine learning", and the prediction seems to be quite normal

```
Trends: [[0.82236939 0.17763061]]
Trending: [[0.5 0.5]]

[Done] exited with code=0 in 0.55 seconds
```

"Trends" is the title of a machine learning article, but it seems to be impossible to make word predictions after it becomes "trending".

```
dimensional: [[0.27839777 0.72160223]]
dimension: [[0.85266113 0.14733887]]

[Done] exited with code=0 in 0.566 seconds
```

"dimensional" is the title of the material article, but "dimension" seems to be mentioned more often in the article on machine learning

```
Environment: [[0.8901329 0.1098671]]
Environmentally friendly: [[0.5 0.5]]
Environmentally friendly Materials: [[0.03114897 0.96885103]]
Materials: [[0.03114897 0.96885103]]

[Done] exited with code=0 in 0.564 seconds
```

It's interesting that the word "environment" seems to be mentioned more often in machine learning articles. But "environmentally friendly" is unpredictable. It becomes predictable when the "materials" is added, but this result seems to be completely biased by the word "materials".

```
From existing online data, would be considerable those data be made available for benefits.:
 [[9.99999989e-01 1.13060293e-08]]
Lasing might also be possible LED were to be integrated with optical cavity.:
 [[5.05242184e-04 9.99494758e-01]]

[Done] exited with code=0 in 0.544 seconds
```

Finally, I searched for sentences from the two articles and modified them. It seems that the longer the sentence, the more certain the prediction.

naive bayes seems to be completely unresponsive to the words that are related but do not appear in the article at all.

## course feedback comment:

The basic content of the course is of normal difficulty, but the advanced work does take a lot of time to complete. Unfortunately, I am too busy to complete advanced assignments. I hope it is not too limited to MATLAB, because I usually use the ubuntu system. This time for the course I find the MATLAB cloud service is a bit troublesome. And unless you've been a student, MATLAB is not free. I hope to use more free and open software.
The github URL for this assignment:
https://github.com/qwe789qwec/Fundamental-Theory-of-Intelligent-Interaction-Systems/tree/master/class3