NOTIONS UNIVERSELLES SUR L'ANALYSE DE DONNÉES

« Les rapports qui disent que quelque chose ne s'est pas passé sont toujours intéressants pour moi, parce que, comme nous le savons, il y a des **connus connus**; des choses connues comme étant connues. Nous savons aussi qu'il y a des **connus inconnus**, c'est-à-dire, qu'il y a des choses que nous savons que nous ne savons pas. Mais il y a aussi des **inconnus inconnus**, des choses que nous ne savons pas que nous ne savons pas.»
[Traduction]

Donald Rumsfeld, point de presse du Département de la défense des États-Unis, 2002

APERÇU

1. Données, AA et IA dans l'actualité
2. Données 101 – Notions de données de base
3. Quelques définitions pratiques
4. Flux de travail et sources – le processus de travail avec les données
5. Modèles et pensée systémique
6. Considérations éthiques et pratiques exemplaires

DONNÉES, APPRENTISSAGE AUTOMATIQUE ET INTELLIGENCE ARTIFICIELLE DANS L'ACTUALITÉ

NOTIONS UNIVERSELLES SUR L'ANALYSE DE DONNÉES

IDLEWYLD Sysabee DAVHILL

data-action-lab.com

OBJECTIFS D'APPRENTISSAGE DU MODULE

Accroître la prise de conscience du rôle croissant de la science des données, de l'apprentissage automatique et de l'intelligence artificielle dans différents domaines de la société.

Accroître la sensibilisation au sujet des fonctionnalités/capacités possibles de ces technologies.

Accroître la sensibilisation concernant certains des enjeux sociaux découlant du rôle croissant de ces technologies.

News

Robots are better than doctors at diagnosing some cancers, major study finds

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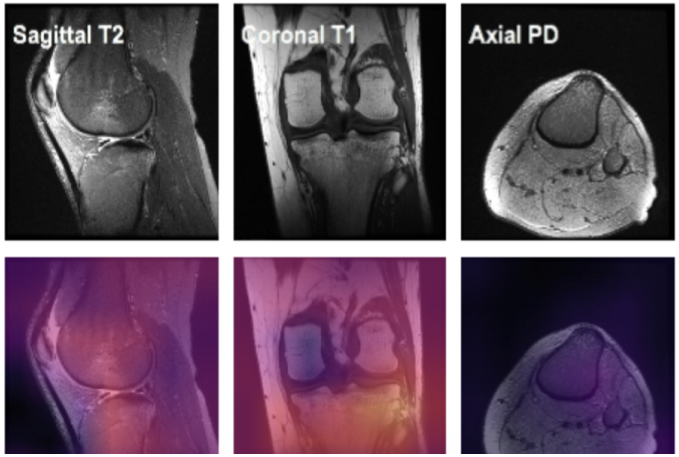
Save 7

Stanford ML Group

MRNet: Deep-learning-assisted diagnosis for knee magnetic resonance imaging

Nicholas Bien *, Pranav Rajpurkar *, Robyn L. Ball, Jeremy Irvin, Allison Park, Erik Jones, Michael Bereket, Bhavik N. Patel, Kristen W. Yeom, Katie Shpanskaya, Safwan Halabi, Evan Zucker, Gary Fanton, Derek F. Amanatullah, Christopher F. Beaulieu, Geoffrey M. Riley, Russell J. Stewart, Francis G. Blankenberg, David B. Larson, Ricky H. Jones, Curtis P. Langlotz, Andrew Y. Ng†, Matthew P. Lungren†

We developed an algorithm to predict abnormalities in knee MRI exams, and measured the clinical utility of providing the algorithm's predictions to radiologists and surgeons during interpretation.



Magnetic resonance (MR) imaging of the knee is the standard of care imaging modality to evaluate knee

Google AI Claims 99 Percent Accuracy In Metastatic Breast Cancer Detection

34

Posted by **BeauHD** on Friday October 12, 2018 @08:00PM from the promising-solutions dept.

Researchers at the Naval Medical Center San Diego and Google AI, a division within Google dedicated to artificial intelligence research, are using cancer-detecting algorithms to detect metastatic tumors by autonomously evaluating lymph node biopsies. VentureBeat reports:

> Their AI system -- dubbed Lymph Node Assistant, or LYNA -- is described in a paper titled "Artificial Intelligence-Based Breast Cancer Nodal Metastasis Detection," published in The American Journal of Surgical Pathology. In tests, it achieved an area under the receiver operating characteristic (AUC) -- a measure of detection accuracy -- of 99 percent. That's superior to human pathologists, who according to one recent assessment miss small metastases on individual slides as much as 62 percent of the time when under time constraints. LYNA is based on Inception-v3, an open source image recognition deep learning model that's been shown to achieve greater than 78.1 percent accuracy on Stanford's ImageNet dataset. As the researchers explained, it takes as input a 299-pixel image (Inception-v3's default input size), outlines tumors at the pixel level, and, in the course of training, extracts labels -- i.e., predictions -- of the tissue patch ("benign" or "tumor") and adjusts the model's algorithmic weights to reduce error.
>
> In tests, LYNA achieved 99.3 percent slide-level accuracy. When the model's sensitivity threshold was adjusted to detect all tumors on every slide, it exhibited 69 percent sensitivity, accurately identifying all 40 metastases in the evaluation dataset without any false positives. Moreover, it was unaffected by artifacts in the slides such as air bubbles, poor processing, hemorrhage, and overstaining. LYNA wasn't perfect -- it occasionally misidentified giant cells, germinal cancers, and bone marrow-derived white blood cells known as histiocytes -- but managed to perform better than a practicing pathologist tasked with evaluating the same slides. And in a second paper published by Google AI and Verily, Google parent company Alphabet's life sciences subsidiary, the model halved the amount of time it took for a six-person team of board-certified pathologists to detect metastases in lymph nodes.

Data scientists find connections between birth month and health

Date: June 8, 2015

Source: Columbia University Medical Center

Summary: Scientists have developed a computational method to investigate the relationship between birth month and disease risk. The researchers used this algorithm to examine New York City medical databases and found 55 diseases that correlated with the season of birth. Overall, the study indicated people born in May had the lowest disease risk, and those born in October the highest.

Share:

9
Oct
2018

Scientists Using GPS Tracking on Endangered Dhole Wild Dogs

Researchers Successfully Tag a Dhole. Wildlife scientists around the globe are ecstatic to hear that researchers were able to successfully place a GPS tracking device onto a dhole. This marks the first time in history that conservationists have been able to place a collar on one of these very rare Indian wild dogs. It's estimated that less than 2,500 of these creatures still exist globally.

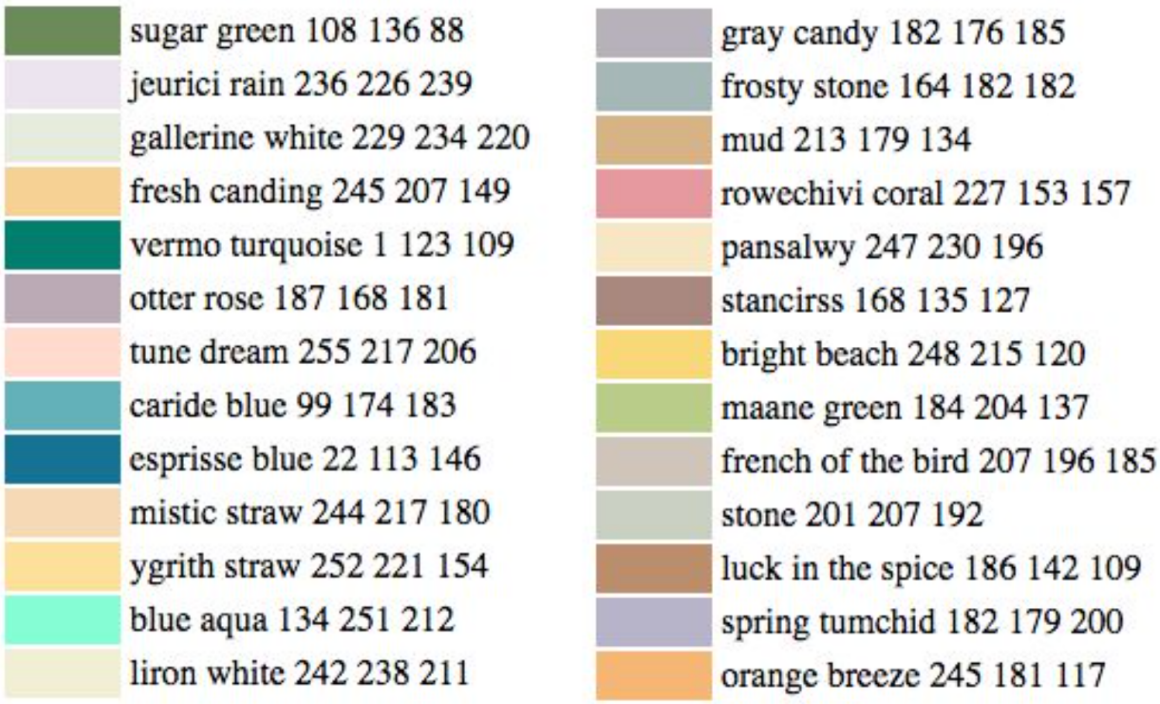
DESIGN

These AI-invented paint color names are so bad they're good

1

What's in a (paint) name?

By **Sam Reichman** | May 31, 2017, 5:12pm EDT



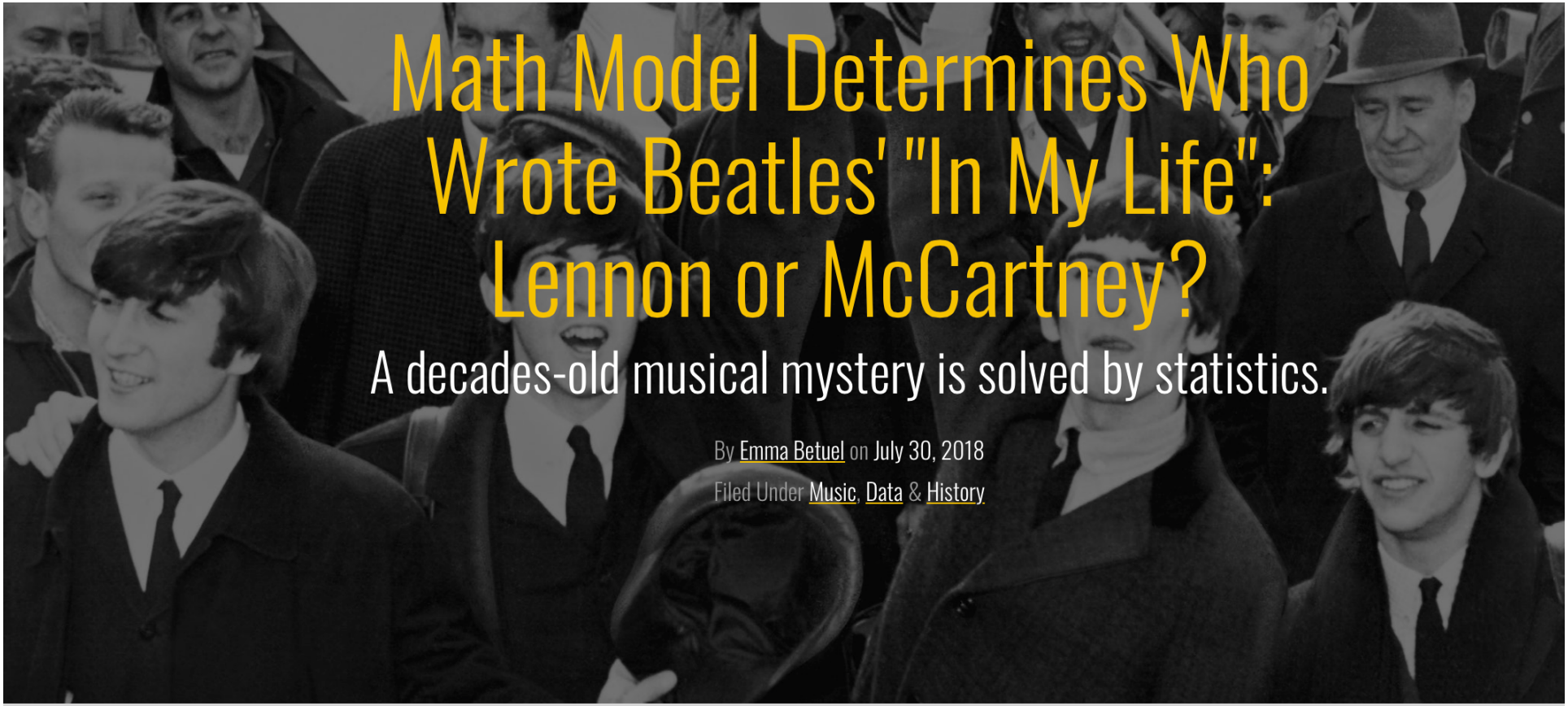
Intelligent Machines

We tried teaching an AI to write Christmas movie plots. Hilarity ensued. Eventually.

Using a neural network to create ridiculous plot lines takes a lot of work—and reveals the challenges of generating human language.

by Karen Hao December 21, 2018

MR. TECH



Math Model Determines Who Wrote Beatles' "In My Life": Lennon or McCartney?

A decades-old musical mystery is solved by statistics.

By Emma Betuel on July 30, 2018

Filed Under Music, Data & History

Scientists use Instagram data to forecast top models at New York Fashion Week

Method is 80 percent accurate in identifying most popular models for the following season

Date: September 3, 2015

Source: Indiana University

Summary: Researchers have predicted the popularity of new faces to the world of fashion modeling with over 80 percent accuracy using advanced computational methods and data from Instagram.

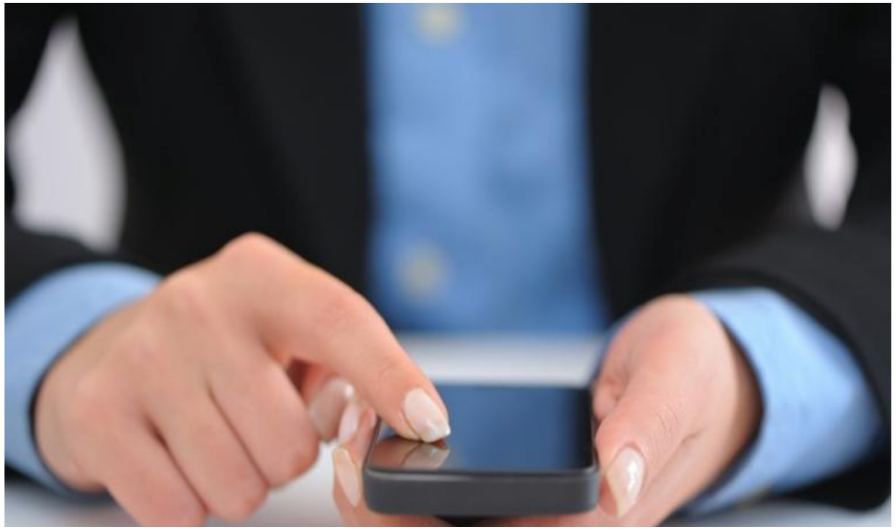
Share:

How big data will solve your email problem

That deluge in your inbox needs to be handled. A team of Israeli researchers thinks big data has some answers that can help.

By Jason Hiner | October 2, 2013 -- 16:05 GMT (09:05 PDT) | Topic: Going Deep on Big Data

6



NEWSLETTERS

ZDNet Big Data

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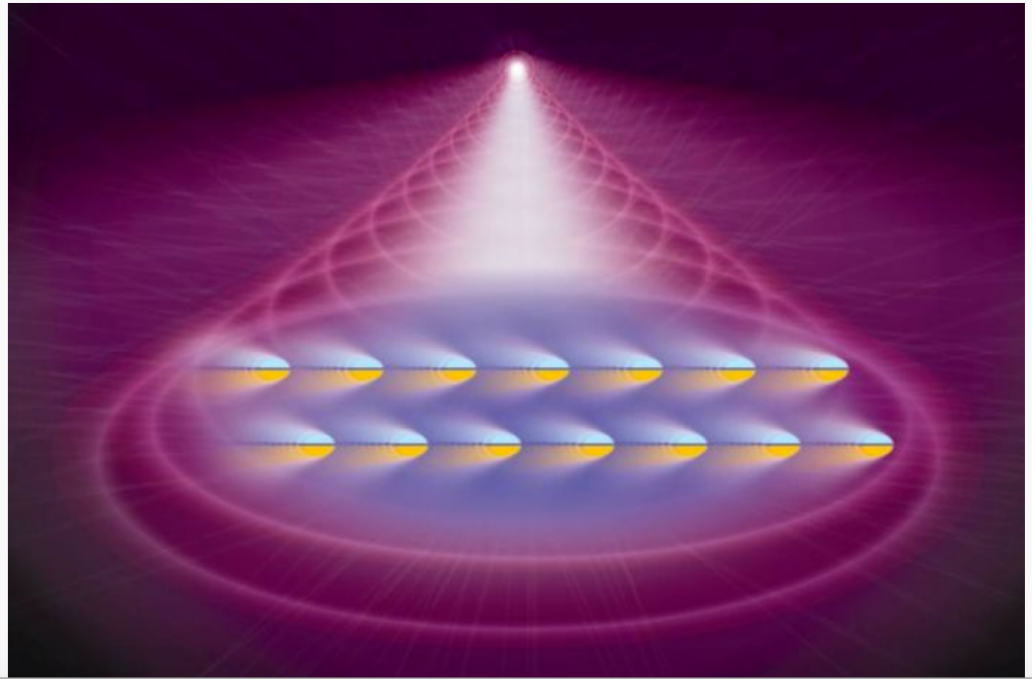
Artificial intelligence better than physicists at designing quantum science experiments

Share on Facebook Share on Twitter

ABC Science By science reporter Belinda Smith

Posted 19 October 2018 at 3:36 pm



Wonkblog • Analysis

This researcher studied 400,000 knitters and discovered what turns a hobby into a business

Most Read Business

1 **Perspective**
I ordered a box of crickets from the Internet and it went about as well as you'd expect

2 As a grocery chain is dismantled, investors recover their money. Worker pensions are short millions.

3 Markets poised to finish year with worst performance in a decade — and the volatility seems certain to continue

SCIENCE

Wait, Have We Really Wiped Out 60 Percent of Animals?

The findings of a major new report have been widely mischaracterized —although the actual news is still grim.

ED YONG OCT 31, 2018

MORE STORIES

Animals Are Riding an Escalator to Extinction
ED YONG

It Will Take Millions of Years for Mammals to Recover From Us
ED YONG

In a Few Centuries, Cows Could Be the Largest Land Animals Left
ED YONG

An Ancient Tradition

BUSINESS NEWS OCTOBER 9, 2018 / 11:12 PM / 2 DAYS AGO

Amazon scraps secret AI recruiting tool that showed bias against women

Jeffrey Dastin
8 MIN READ

SAN FRANCISCO (Reuters) - Amazon.com Inc's (AMZN.O) machine-learning specialists uncovered a big problem: their new recruiting engine did not like women.

Facebook documents seized by MPs investigating privacy breach

25 November 2018 | Business

A cache of Facebook documents has been seized by MPs investigating the Cambridge Analytica data scandal.

The New York Times

Firm Led by Google Veterans Uses A.I. to 'Nudge' Workers Toward Happiness

At Netflix, Who Wins When It's Hollywood vs. the Algorithm?

As the company plunges deeper into originals, its L.A. wing is doing the once-unthinkable: overriding the metrics

The cast of Netflix original show 'GLOW.' NETFLIX

By Shalini Ramachandran and Joe Flint

100 COMMENTS

Nov. 10, 2018 12:00 a.m. ET

Netflix Inc.'s executives were torn. On the one hand they trusted the company's algorithm. On the other they were worried about ticking off Jane Fonda.

After the streaming-video giant released the second season of the comedy "Grace and Frankie" in 2016, its product team put up an image to promote the show to U.S. subscribers that only included Ms. Fonda's co-star, Lily Tomlin. Tests showed that more users clicked on the show when the photo didn't include Ms. Fonda.

DONNÉES 101 – NOTIONS DE DONNÉES DE BASE

NOTIONS UNIVERSELLES SUR L'ANALYSE DE DONNÉES

« Vous pouvez avoir des données sans information, mais vous ne pouvez pas avoir d'information sans données. » [Traduction]

Attribué à Daniel Keys Moran

OBJECTIFS D'APPRENTISSAGE DU MODULE

Connaissance préliminaire des notions suivantes :

- Données, attribut (propriété, facteur, variable)
- Modèles prédictifs, modèles explicatifs
- Classification, estimation des probabilités de classe, regroupement, règles d'association, analyse des séries chronologiques, détection des anomalies, arbre décisionnel, apprentissage supervisé, apprentissage non supervisé

Comparer et mettre en contraste : la science des données par rapport à l'analyse (veille stratégique).

Connaissance des niveaux appropriés de confiance dans les modèles.

QU'EST-CE QU'UNE DONNÉE? D'OÙ PROVIENT-ELLE?

4 529 « rouge » 25 782 « Y »

OBJETS ET ATTRIBUTS

Objet : pomme

Forme : sphérique

Couleur : rouge

Fonction : alimentaire

Emplacement : réfrigérateur

Propriétaire : Jen

Rappelez-vous : une personne ou un objet n'est pas simplement la somme de ses attributs!

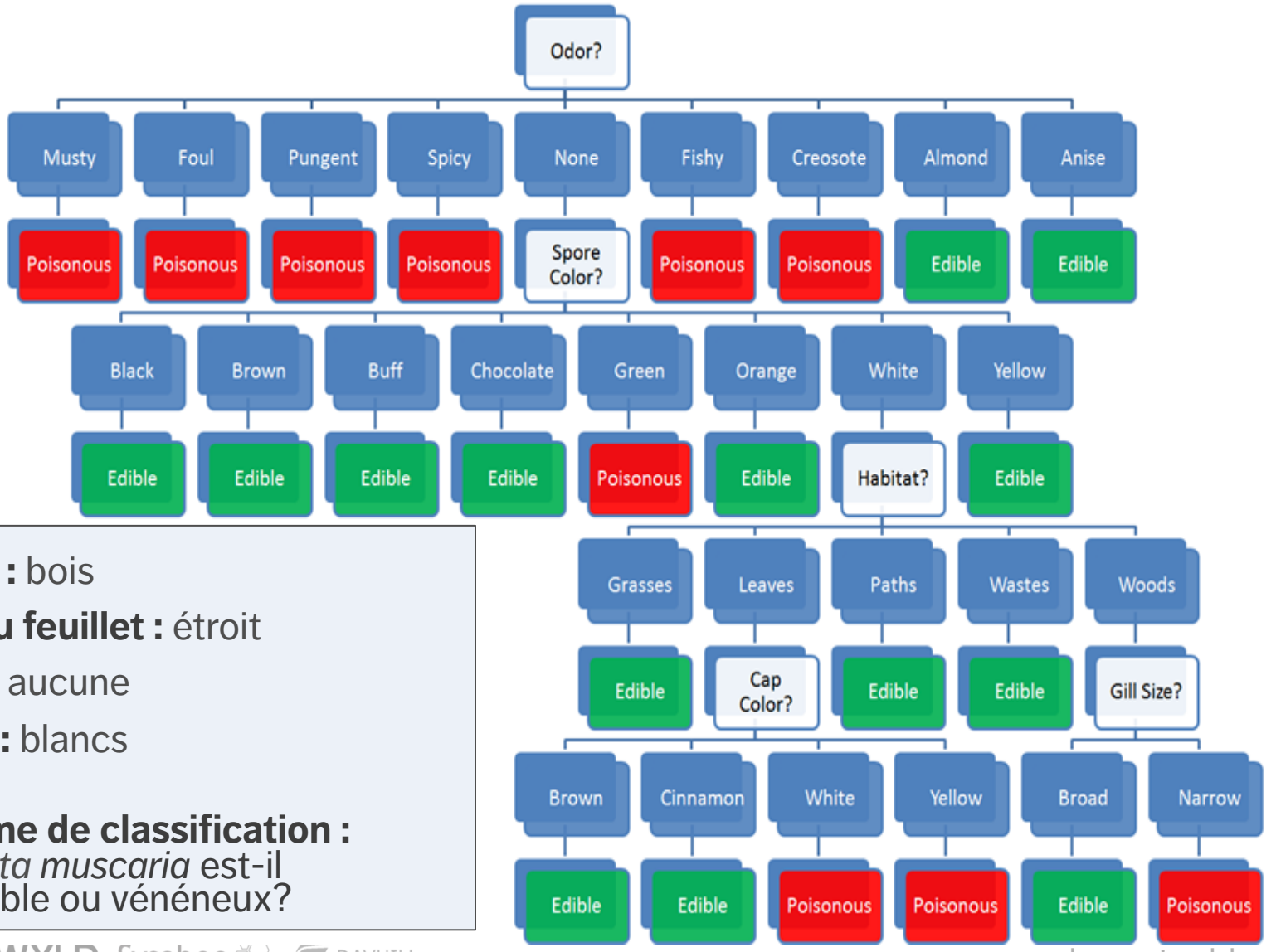
[https://archive.ics.uci.edu/ml/datasets/Mushroom]

ENSEMBLE DE DONNÉES SUR LES CHAMPIGNONS VÉNÉNEUX

Amanita muscaria

Habitat : bois
Taille du feuillet : étroit
Odeur : aucune
Spores : blancs

Problème de classification : L'*Amanita muscaria* est-il comestible ou vénéneux?



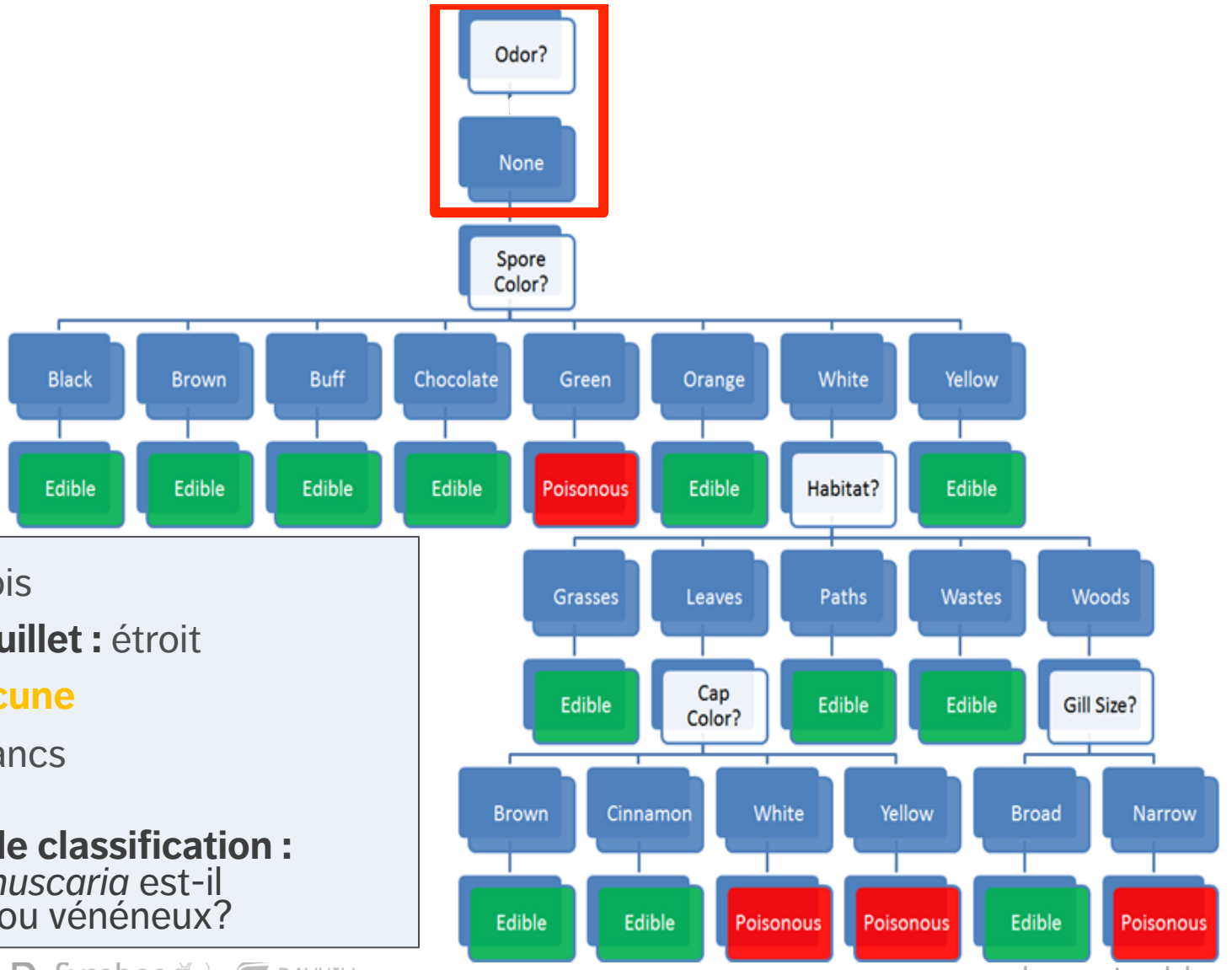
Habitat : bois

Taille du feuillet : étroit

Odeur : aucune

Spores : blancs

Problème de classification :
L'*Amanita muscaria* est-il comestible ou vénéneux?



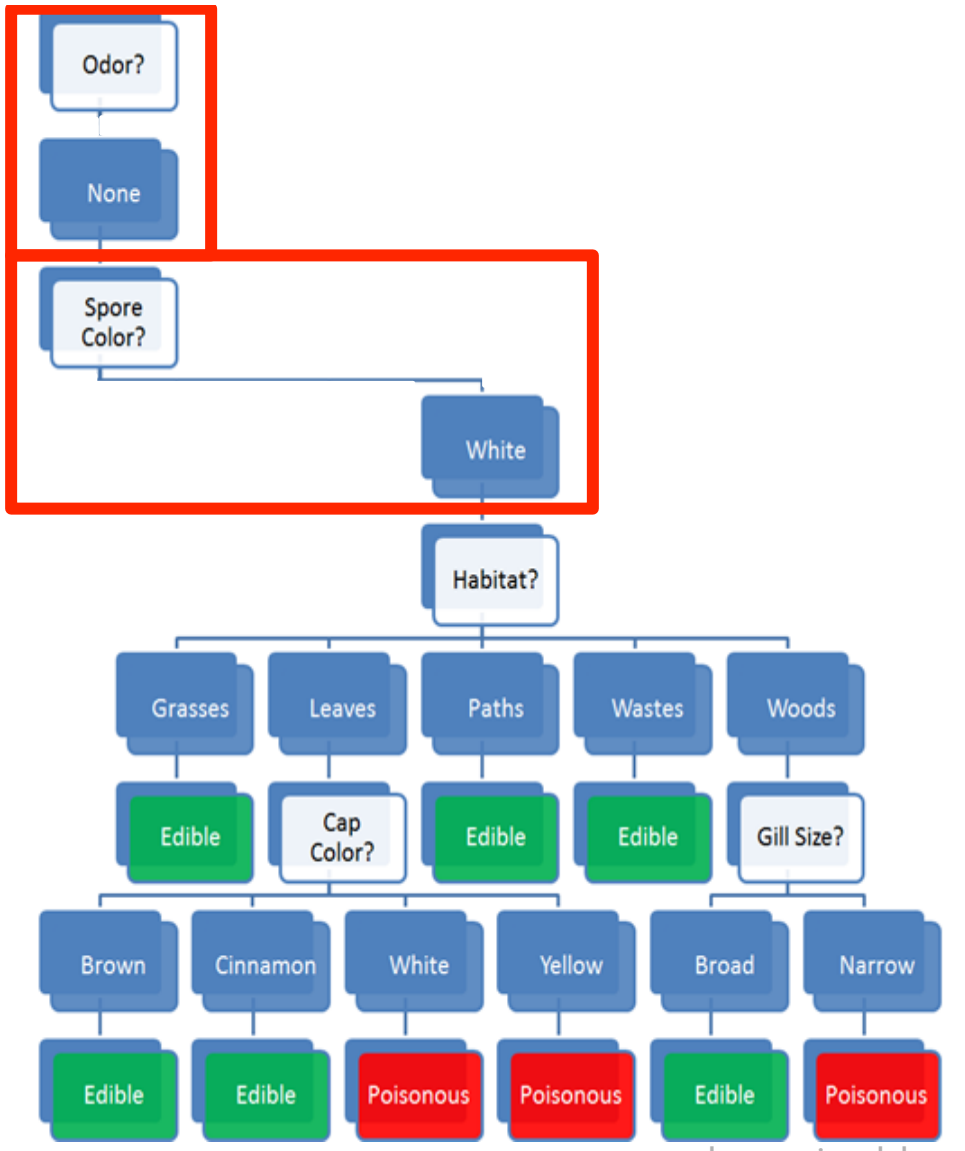
Habitat : bois

Taille du feuillet : étroit

Odeur : **aucune**

Spores : blancs

Problème de classification :
L'*Amanita muscaria* est-il comestible ou vénéneux?



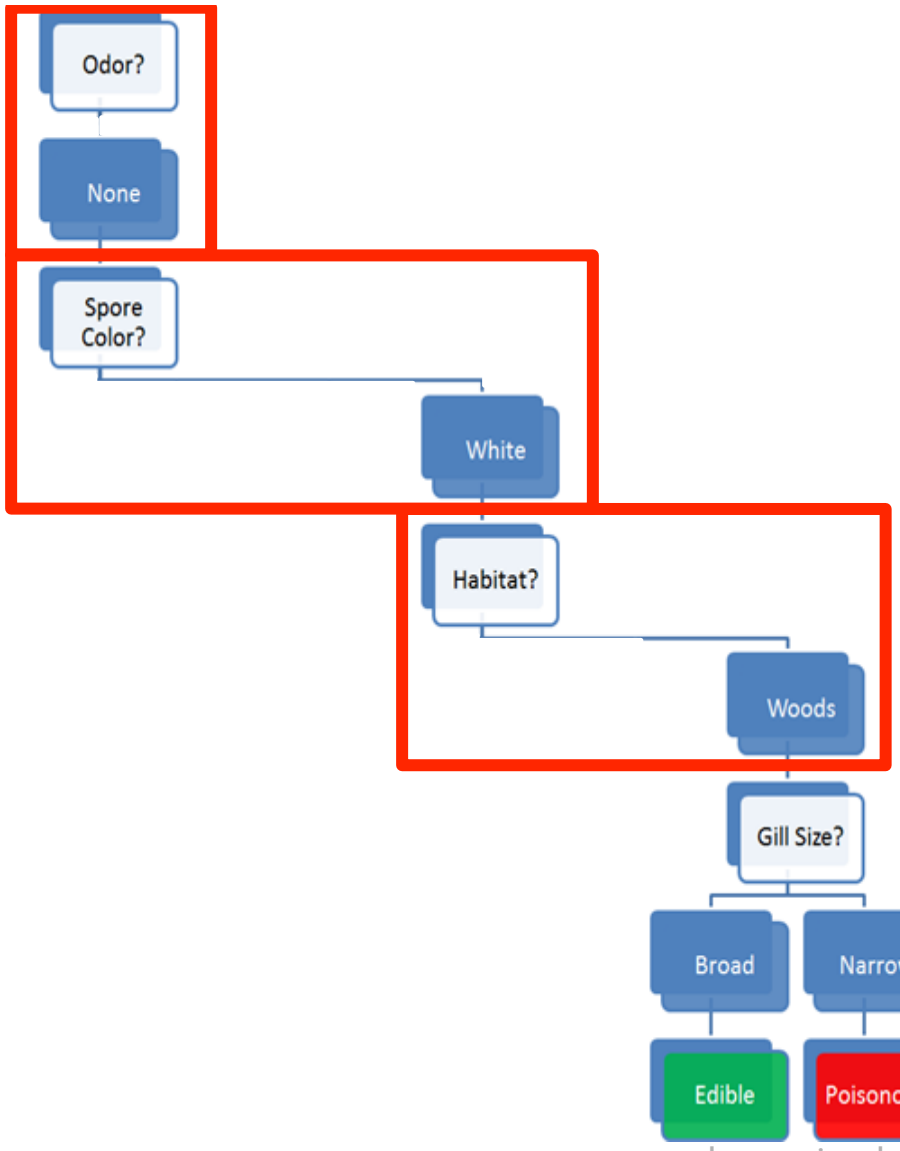
Habitat : bois

Taille du feuillet : étroit

Odeur : aucune

Spores : **blancs**

Problème de classification :
L'*Amanita muscaria* est-il comestible ou vénéneux?



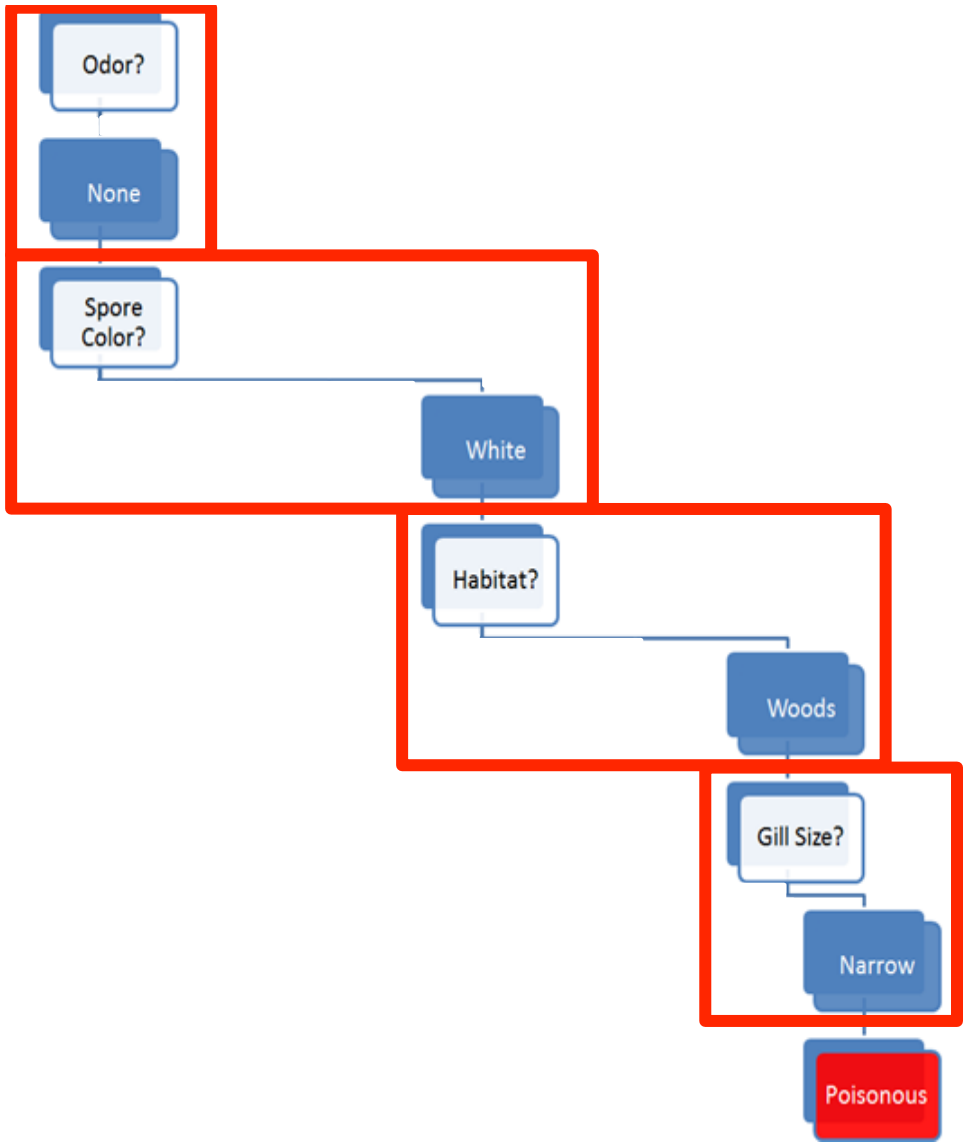
Habitat : bois

Taille du feuillet : étroit

Odeur : aucune

Spores : blancs

Problème de classification :
L'*Amanita muscaria* est-il comestible ou vénéneux?



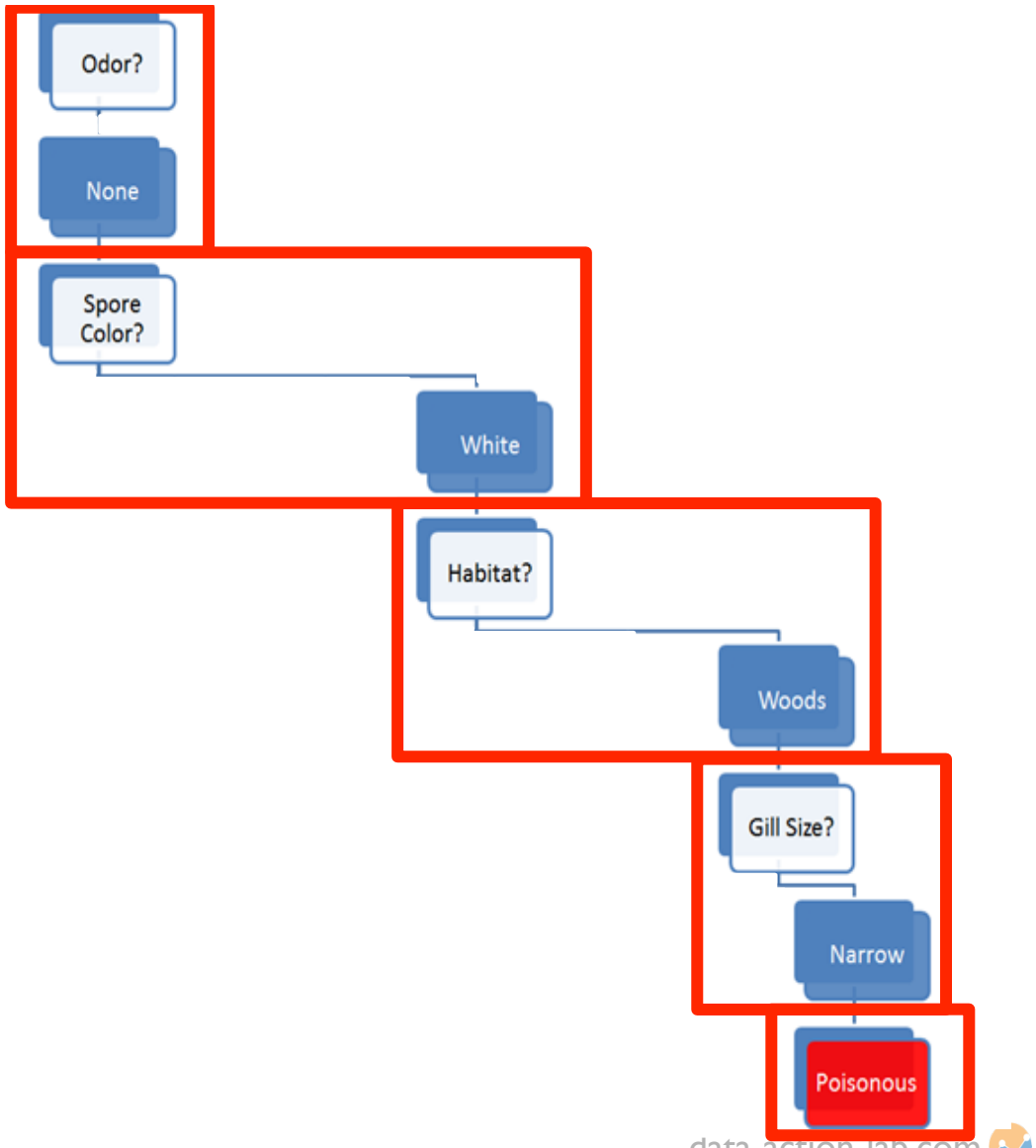
Habitat : bois

Taille du feuillet : étroit

Odeur : aucune

Spores : blancs

Problème de classification :
L'*Amanita muscaria* est-il comestible ou vénéneux?



Habitat : bois

Taille du feuillet : étroit

Odeur : aucune

Spores : blancs

Problème de classification :
L'*Amanita muscaria* est-il comestible ou **vénéneux**?

DISCUSSION

Feriez-vous confiance à une prédiction disant que l'*Amanita muscaria* est « **comestible** »?

D'où vient le modèle?

Que devez-vous savoir pour faire confiance au modèle?

Quel est le coût d'une erreur de classification, dans ce cas-ci?

POSER LES BONNES QUESTIONS

La science des données consiste en réalité à poser des questions et à y répondre :

- **Analytique :** « Combien de fois a-t-on cliqué sur ce lien? »
- **Science des données :** « D'après l'historique des achats de cet utilisateur, puis-je prédire sur quels liens il cliquera la prochaine fois qu'il accèdera au site? »

Les modèles d'exploration/de science des données sont habituellement **prédictifs** (non **explicatifs**) : ils montrent les liens, mais ne révèlent pas pourquoi ils existent.

Attention : Toutes les situations n'exigent pas de faire appel à la science des données, à l'intelligence artificielle, à l'apprentissage automatique ou à l'analyse.

TÂCHES DE LA SCIENCE DES DONNÉES / L'APPRENTISSAGE AUTOMATIQUE / L'I.A.

Classification et **estimation de la probabilité de la classe :** quels clients sont susceptibles d'être des clients réguliers?

Regroupement : les clients forment-ils des groupes naturels?

Découverte de règles d'association : quels sont les livres couramment achetés ensemble?

Autres :

Profilage et description du comportement; **prédiction des liens**; **estimation de la valeur** (combien un client est-il susceptible de dépenser dans un restaurant); **appariement des similitudes** (quels clients potentiels sont semblables aux meilleurs clients d'une entreprise?); **réduction des données**; **modélisation de l'influence et modélisation causale**, etc.

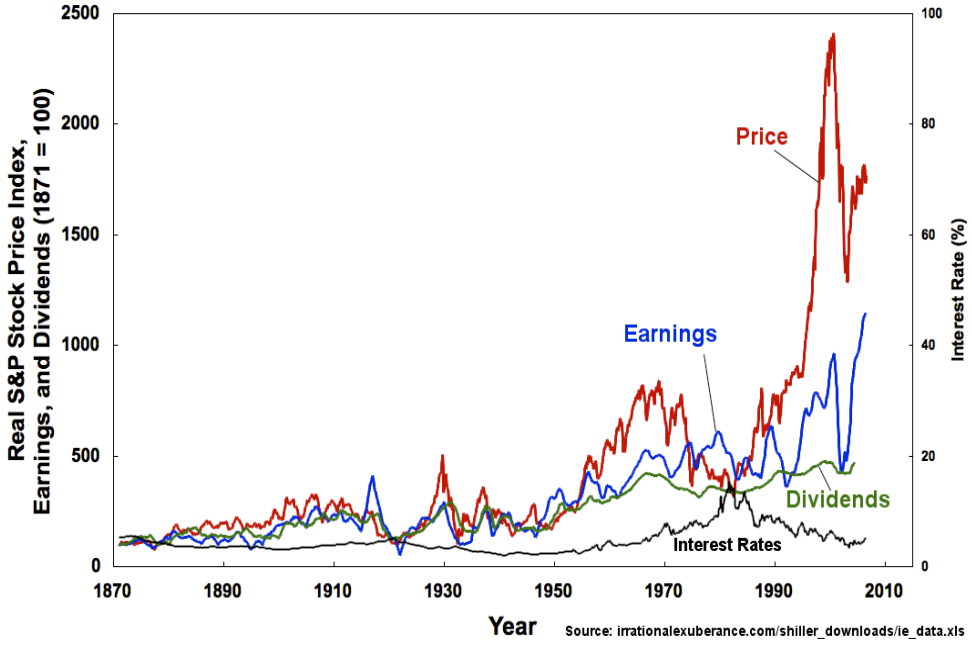
ANALYSE DES SÉRIES CHRONOLOGIQUES

Une série chronologique simple :

- Possède deux variables : le temps + une 2e variable
- La deuxième variable est *séquentielle*

Quel est le comportement de cette deuxième variable au fil du temps? Par rapport à d'autres variables?

Pouvons-nous utiliser cette information pour prévoir le comportement de la variable à l'avenir?



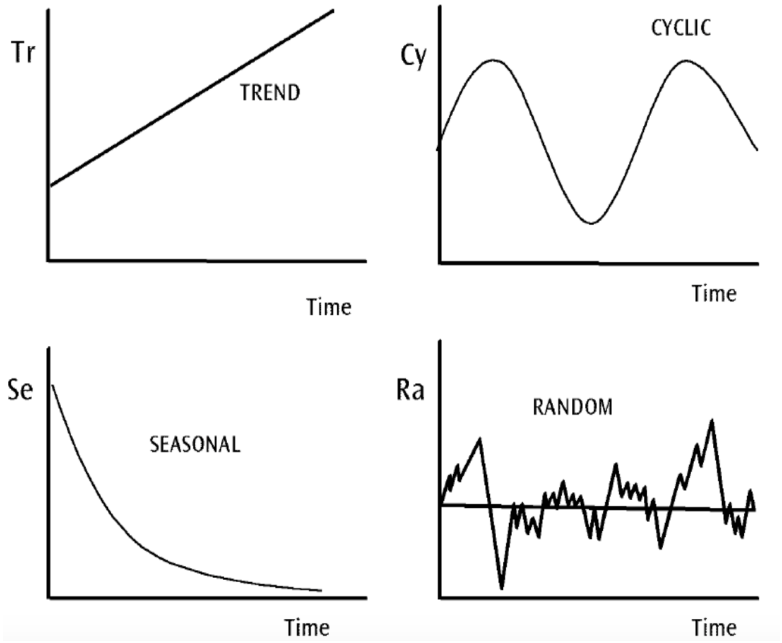
SCHÉMAS TEMPORELS

Il s'agit ici de nos objectifs d'analyse habituels :

- Trouver des tendances dans les données
- Créer un modèle (mathématique) qui saisit l'essence de ces tendances

Les tendances peuvent être assez complexes – une analyse poussée est généralement nécessaire!

En particulier, l'ensemble de la série peut souvent être décomposé en plusieurs **modèles de composantes**. Il existe des bibliothèques de logiciels qui peuvent vous aider!



ÉTUDES DE CAS DES SÉRIES CHRONOLOGIQUES

Communication Research
2018, Vol. 45(7) 1012–1030

DOI: 10.1177/0093650215581370
journals.sagepub.com/home/crx
SAGE

A Time-Series Analysis of International Public Relations Expenditure and Economic Outcome

Suman Lee[1] and Byungwook Kim[2]

Abstract

This study tested a causal relationship between international public relations (PR) expenditure and its economic outcome at the country level by using a time-series analysis. International PR expenditures of four client countries (Japan, Colombia, Belgium, and the Philippines) were collected from the semi-annual reports of the Foreign Agency Registration Act (FARA) from 1996 to 2009. Economic outcome was measured by U.S. imports from the client countries and U.S. foreign direct investment (FDI) toward them. This study found that the past PR expenditure holds power in forecasting future economic outcomes for Japan, Belgium, and the Philippines except Colombia.

Keywords

international public relations, PR return on investment, bottom-line effect, time-series analysis, Granger causality test

RESEARCH ARTICLE

Seiya MAKI, Shuichi ASHINA, Minoru FUJII, Tsuyoshi FUJITA, Norio YABE, Kenji UCHIDA, Gito GINTING, Rizaldi BOER, Remi CHANDRAN

Employing electricity-consumption monitoring systems and integrative time-series analysis models: A case study in Bogor, Indonesia

Abstract The Paris Agreement calls for maintaining a global temperature less than 2°C above the pre-industrial level and pursuing efforts to limit the temperature increase even further to 1.5°C. To realize this objective and promote a low-carbon society, and because energy production and use is the largest source of global greenhouse-gas (GHG) emissions, it is important to efficiently manage energy demand and supply systems. This, in turn, requires theoretical and practical research and innovation in smart energy monitoring technologies, the identification of appropriate methods for detailed time-series analysis, and the application of these technologies at urban and national scales. Further, because developing countries contribute increasing shares of domestic energy consumption, it is important to consider the application of such innovations in these areas. Motivated by the mandates set out in global agreements on climate change and low-carbon societies, this paper focuses on the development of a smart energy monitoring system (SEMS) and its deployment in households and public and commercial sectors in Bogor, Indonesia. An electricity demand prediction model is developed for each device using the Auto-Regression eXogenous model. The real-time SEMS data and time-series clustering to explore similarities in electricity consumption patterns between monitored units, such as residential, public, and commercial buildings, in Bogor is, then, used. These clusters are evaluated using peak demand and Ramadan term characteristics. The resulting energy-prediction models can be used for low-carbon planning.

Keywords electricity monitoring, electricity demand prediction, multiple-variable time-series modeling, time-series cluster analysis, Indonesia

Received Dec. 30, 2017; accepted Mar. 28, 2018; online May 30, 2018

1 Introduction

1.1 Background and objectives

To attain a low-carbon society, it is necessary to transform the centralized energy system into distributed systems at city and regional scales. Because energy demand patterns vary spatially, more detailed data on energy demand provided by innovative Information Communication Technologies (ICTs) is expected to enable local energy demand and supply system optimization in which distributed renewable energy resources can be integrated with large-scale grid energy supply systems.

Energy information and data at local scales, particularly in developing countries, is persistently unavailable. However, there is enormous potential to reduce energy use in various sectors through the use of rapidly developing ICT systems in energy management. The

MAKI ET COLL. : SYSTÈME D'ANALYSE DES DONNÉES

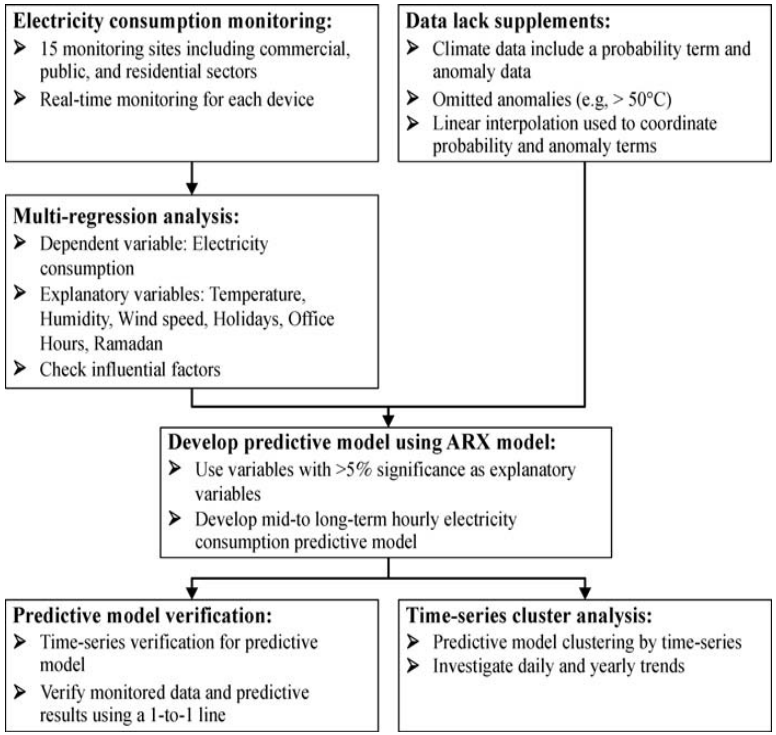


Fig. 1 Analytical procedure used in this paper

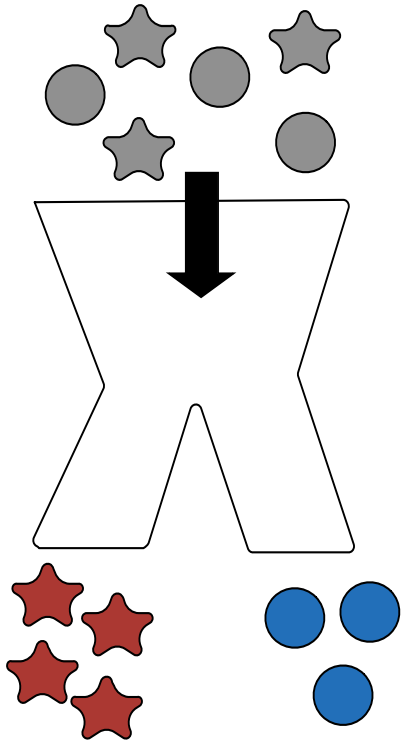
CLASSIFICATION

Classificateur : Si un objet m'est présenté, puis-je le classifier dans l'une des catégories prédéfinies?

Il existe beaucoup de techniques différentes pour réaliser cela, mais les étapes sont les mêmes :

- Utilisez une *trousse de formation* pour apprendre au classificateur à classifier
- Mettez à l'essai/validez le classificateur à l'aide de *nouvelles données*
- Utilisez le classificateur pour classifier les *nouvelles instances.*

Certains classificateurs (par exemple les réseaux neuronaux) sont très similaires à une « boîte noire ». Ils sont peut-être bons pour classer, mais vous ne savez pas pourquoi!



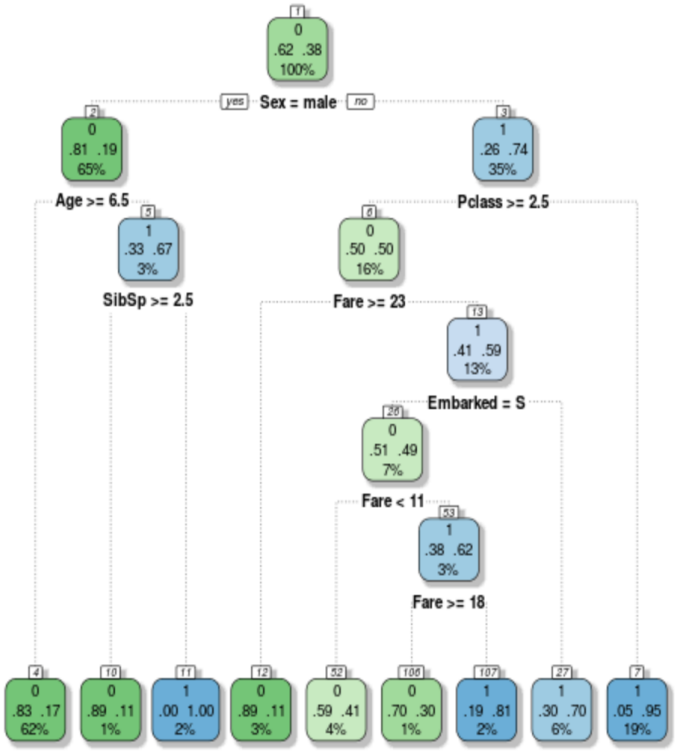
CLASSIFICATEURS D'ARBRES DE DÉCISION

Arbre de décision : Quelles sont vos propriétés? J'utiliserai (méthodiquement) cette information pour m'aider à vous classer.

Il existe des techniques que nous pouvons utiliser pour construire *automatiquement* ces arbres de décision.

Une fois l'arbre construit, nous pouvons voir comment la décision est prise.

Ils sont également utiles pour les systèmes experts.



ORIGINAL ARTICLE

Profiling Arthritis Pain with a Decision Tree

Man Hung, PhD; Jerry Bounsanga, BS; Fangzhou Liu, MS; Maren W. Voss, MS
Department of Orthopaedics, University of Utah, Salt Lake City, Utah, U.S.A.

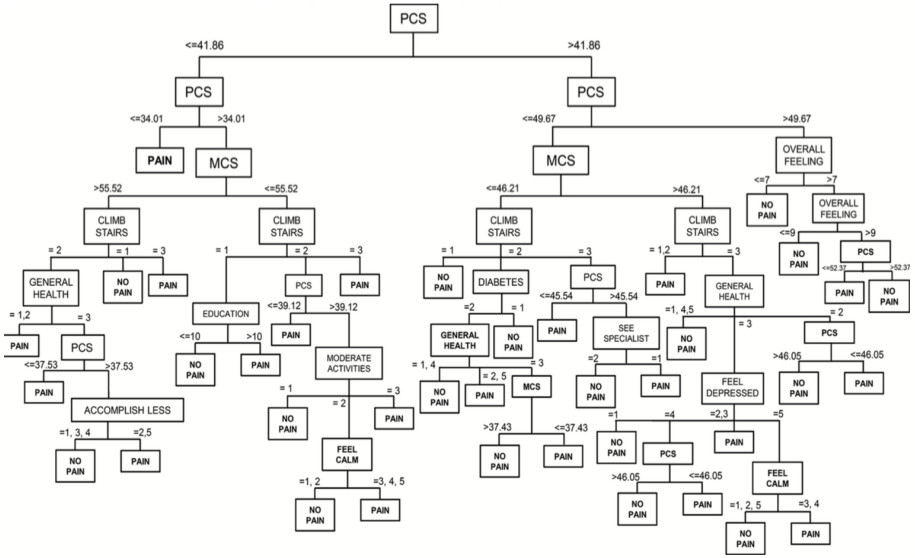
■ **Abstract**

Background: Arthritis is the leading cause of work disability and contributes to lost productivity. Previous studies showed that various factors predict pain, but they were limited in sample size and scope from a data analytics perspective.
Objectives: The current study applied machine learning algorithms to identify predictors of pain associated with arthritis in a large national sample.
Methods: Using data from the 2011 to 2012 Medical Expenditure Panel Survey, data mining was performed to develop algorithms to identify factors and patterns that contribute to risk of pain. The model incorporated over 200 variables within the algorithm development, including demographic data, medical claims, laboratory tests, patient-reported outcomes, and sociobehavioral characteristics.
Results: The developed algorithms to predict pain utilize variables readily available in patient medical records. Using the machine learning classification algorithm J48 with 50-fold cross-validations, we found that the model can significantly distinguish those with and without pain (c-statistics = 0.9108). The *F* measure was 0.856, accuracy rate was 85.68%, sensitivity was 0.862, specificity was 0.852, and precision was 0.849.
Conclusion: Physical and mental function scores, the ability to climb stairs, and overall assessment of feeling were the most discriminative predictors from the 12 identified variables, predicting pain with 86% accuracy for individuals with arthritis. In this era of rapid expansion of big data application, the nature of healthcare research is moving from hypothesis-driven to data-driven solutions. The algorithms generated in this study offer new insights on individualized pain prediction, allowing the development of cost-effective care management programs for those experiencing arthritis pain. ■

Key Words: arthritis, pain, big data analytics, data mining, predictive analytics

INTRODUCTION

Loss of productivity and permanent work disability can be caused by physical limitations that result from pain. The cost of pain in both increased healthcare costs and lowered work productivity has been estimated in a 2008 U.S. sample to range from $560 to $635 billion.[1] Prior research has linked associations among pain, arthritis, and productivity[2,3] and the Centers for Disease Control and Prevention reports that 80% of those with arthritis will have pain-related limitations in movement, with 14% requiring routine needs assistance.[4,5] Varying levels of pain are present in many different types of orthopedic conditions, such as arthritis, back pain, and other musculoskeletal problems.[2,3] Economically, the United States spends close to $80 billion on arthritic conditions in addition to $47 billion lost in consumer earnings.[6] Increased mortality rates, myocardial infarction, work disability,[7,8] fatigue,[9] and poor mental health[10–15] make arthritis and the pain it creates an important public health concern.



igure 3. Predictors of pain tree diagram. PCS, Physical Component Summary; MCS, Mental Component Summary.