



Machine Learning opportunities for a standardized Reference Chart of Accounts

Supervised Learning classification at Statistics Netherlands

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Introduction

Statistics Netherlands

Facts that matter

Financial data → statistics on Dutch businesses

Data collection / Center for Big Data Statistics

Machine Learning can accelerate the transition to a standardized classification system of financial information



Financial reporting developments
Automated mapping of ledgers to RGS
Transferring information back



Financial reporting developments



SBR-RGS

Reference Chart of Accounts (RGS)

- Integration and automation
- Jointly developed

Standard Business Reporting (SBR)

- Dutch government initiative

XBRL

Gaining international momentum



SBR-RGS and Statistics Netherlands

Reduce response burden

Questionnaires

No legal obligation to use RGS

SBR-RGS channel opened for quarterly questionnaire

Limited success so far

Benefit and cost

SBR-RGS channel for larger questionnaires

Transferring information back

Automated mapping of ledgers to RGS

Stable taxonomy, or automatically adjusted

Cooperation with accountants and software developers



Automated mapping of ledgers to RGS



ML classification

Predict RGS concepts based on features in description of (company-specific) ledgers

Purpose

- Reduce the workload of companies
- Translation
- Transition

Hierarchical classification



Branch Convolutional Neural Network

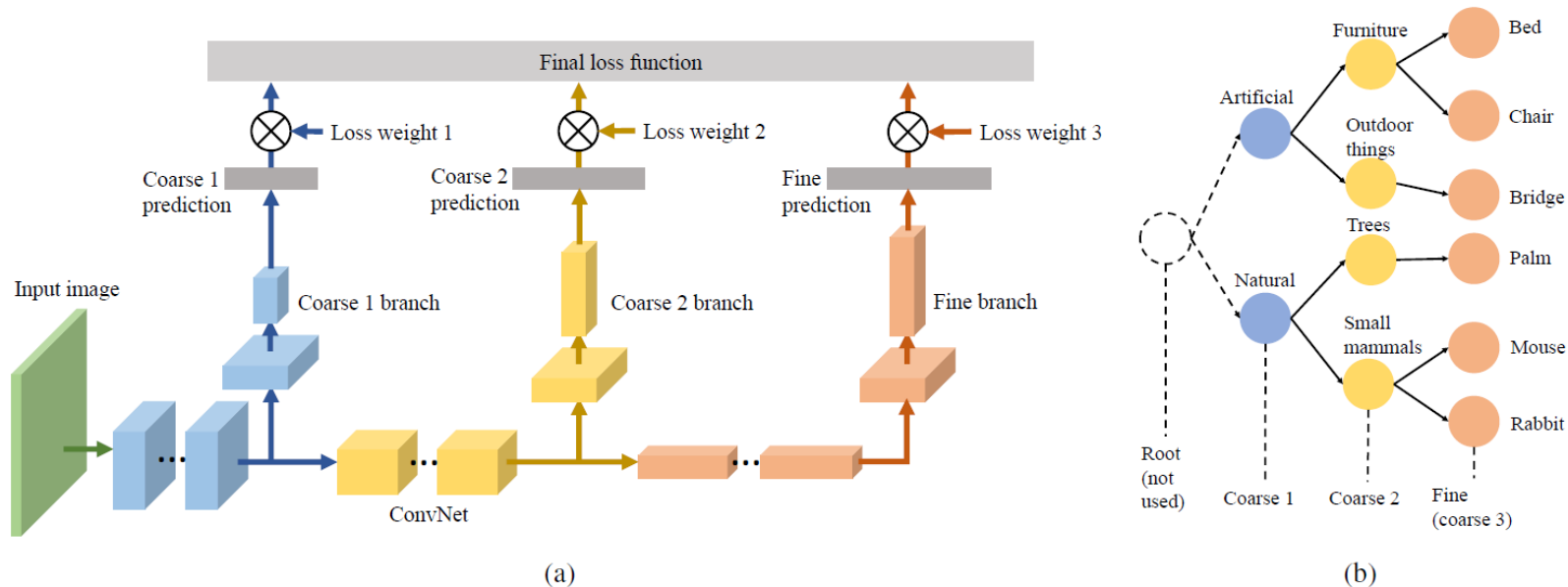


Figure 1: (a) Architecture of Branch Convolutional Neural Network (B-CNN). The network at the bottom can be an arbitrary ConvNet. There can be multiple branch networks and each of them outputs a coarse prediction. The final loss function is a weighted summation of all coarse losses. (b) A sample hierarchical label tree where classes are taken from CIFAR-100 dataset.

Taken from [1] Zhu & Bain (2017)



Challenges and opportunities

Training data

Cooperation with accountancies

Unusual hierarchy classification

Accuracy and aggregation



Transferring information back



ML classification

Based on financial data composition, predict

- probability of solvency
- revenue increase
- ... ?

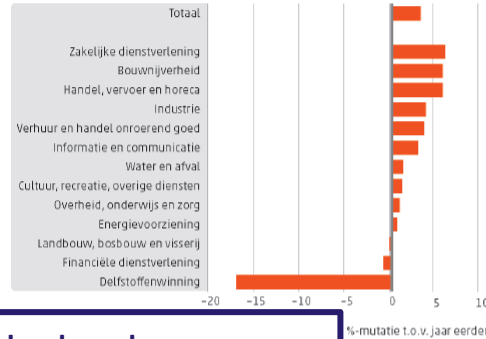
Idea and purpose

- Feedback
- Thank You
- Benchmarking



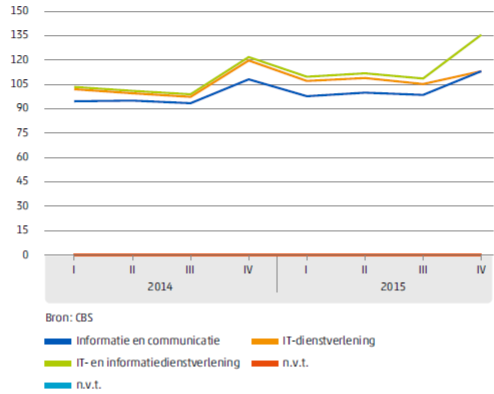
Revenue

Toegevoegde waarde naar bedrijfstak, tweede kwartaal 2017



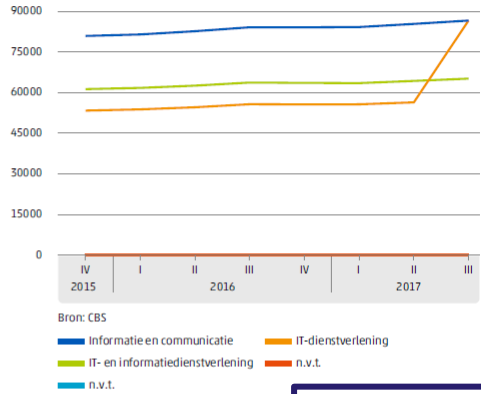
Added value per sector, yearly change

Omzet index kwartaal



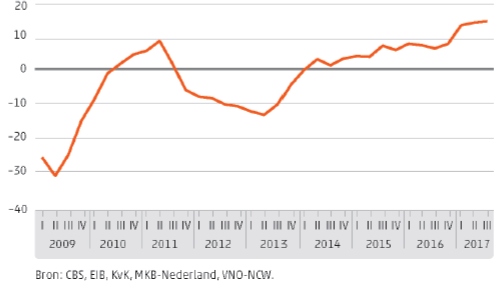
Number of companies

Aantal bedrijven kwartaal



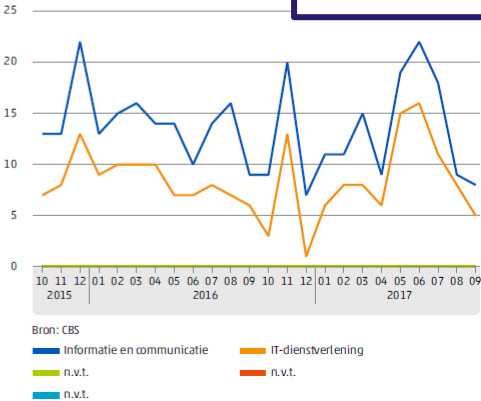
Business outlook

Ondernemersvertrouwen Nederland, totaal niet-financieel bedrijfsleven



Insolvencies

Aantal faillissementen per maand



Insolvencies

850 faillissementen in tweede kwartaal 2017

Challenges and opportunities

Facts that matter

Specific neural network / classification design

Confidence and footnotes

Transfer channel



Conclusions



Conclusions

XBRL technical standard of RGS-SBR

Machine Learning

- Benefit increase: Additional information
- Cost decrease: RGS transition or translation

Trial and Error

Feedback from companies

Partnerships



References

- [1] Zhu, X., & Bain, M. (2017). B-CNN: Branch Convolutional Neural Network for Hierarchical Classification. *arXiv preprint arXiv:1709.09890*.
- [2] Buiten, G., Snijkers, G., Saraiva, P., Erikson, J., Erikson, A.-G., & Born, A. (2018). Business Data Collection: toward Electronic Data Interchange. Experiences in Portugal, Canada, Sweden and the Netherlands with EDI. *Journal of Official Statistics, forthcoming*.

Questions, remarks, or suggestions?



LinkRole	urn:cbs:linkrole:ss-indirect-taxes-excluding-vat					
Definition	Belastingen op verkochte goederen en diensten uitgezonderd BTW					
prefix	name	depth	order	priority	parent	systemid
cbs-abstr	IndirectTaxesExcludingVATTitle	0				
cbs-i	IndirectTaxesExcludingVAT	1	1.0	0	cbs-abstr:IndirectTaxesExcludingVATTitle	cbs-ss-indirect-taxes-excluding
cbs-i	IndirectTaxesExcludingVATDuties	2	1.0	0	cbs-i:IndirectTaxesExcludingVAT	cbs-ss-indirect-taxes-excluding
cbs-i	IndirectTaxesExcludingVATCarsAndMotorcycles	2	2.0	0	cbs-i:IndirectTaxesExcludingVAT	cbs-ss-indirect-taxes-excluding
cbs-i	IndirectTaxesExcludingVATInsuranceTax	2	3.0	0	cbs-i:IndirectTaxesExcludingVAT	cbs-ss-indirect-taxes-excluding
cbs-i	IndirectTaxesExcludingVATOtherProductRelatedTaxes	2	4.0	0	cbs-i:IndirectTaxesExcludingVAT	cbs-ss-indirect-taxes-excluding
cbs-i	IndirectTaxesExcludingVATNotProductRelatedTaxes	2	5.0	0	cbs-i:IndirectTaxesExcludingVAT	cbs-ss-indirect-taxes-excluding

LinkRole	urn:cbs:linkrole:ss-net-revenue					
Definition	Netto-omzet					
prefix	name	depth	order	priority	parent	systemid
cbs-abstr	NetRevenueTitle	0				
venj-bw2-i	NetRevenue	1	1.0	0	cbs-abstr:NetRevenueTitle	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoods	2	1.0	0	venj-bw2-i:NetRevenue	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsGeneralTariff	3	1.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsReducedTariff	3	2.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsOtherRates	3	3.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsPrivateUse	3	4.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsNotTaxed	3	5.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsByWhichVATTaxationIsTransferred	3	6.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProducedGoodsSalesToNonEUCountries	3	7.0	0	cbs-i:NetRevenueProducedGoods	cbs-ss-net-revenue-pre.xml
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cbs-i	NetRevenueTradeGoodsGeneralTariff	3	1.0	0	cbs-i:NetRevenueTradeGoods	cbs-ss-net-revenue-pre.xml
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cbs-i	NetRevenueProvidedServices	2	3.0	0	venj-bw2-i:NetRevenue	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProvidedServicesGeneralTariff	3	1.0	0	cbs-i:NetRevenueProvidedServices	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProvidedServicesReducedTariff	3	2.0	0	cbs-i:NetRevenueProvidedServices	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProvidedServicesOtherRates	3	3.0	0	cbs-i:NetRevenueProvidedServices	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProvidedServicesPrivateUse	3	4.0	0	cbs-i:NetRevenueProvidedServices	cbs-ss-net-revenue-pre.xml
cbs-i	NetRevenueProvidedServicesNotTaxed	3	5.0	0	cbs-i:NetRevenueProvidedServices	cbs-ss-net-revenue-pre.xml



IPEB - Survey on Perspectives of Exports of Goods
May 2016

>> COMPANY IDENTIFICATION

Name: **COMPANY TEST NAME** Fiscal Number **000000000**
 Activity: **2814 - Manufacture of other taps and valves**
 Region: **17 - Área Metropolitana de Lisboa (NUTS II)**

>> INTERNATIONAL TRADE OF GOODS - EXPORTS

COMPANY INDICATORS, 2016

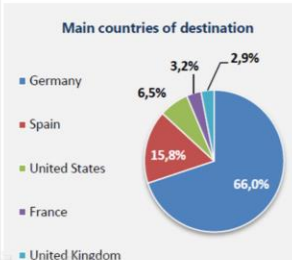


Main goods exported by CN8

Code	Description	SHARE
84818063	Gate valves of steel for pipes, boiler shells, tanks, vats or the like (excl. taps, cocks and valves for sinks, washbasins, bidets, water cisterns, baths and showers and central heating radiator valves)	43,6%
84818099	Appliances for pipes, boiler shells, tanks, vats or the like (excl. pressure-reducing valves, valves for the control of pneumatic power transmission, check "non-return" valves, safety or relief valves, taps, cocks and valves for sinks, baths and similar fixtures, central heating radiator valves, valves for pneumatic tyres ...)	29,1%
84814010	Safety or relief valves of cast iron or steel	11,2%
84813091	Check "non-return" valves for pipes, boiler shells, tanks, vats or the like, of cast iron or steel	9,7%
84818073	Globe valves of steel (excl. temperature regulators, pressure-reducing valves, valves for the control of oleohydraulic or pneumatic power transmission, check valves and safety or relief valves, process control valves, taps, cocks and valves for sinks, washbasins, bidets, water cisterns, baths ...)	4,2%



INDICATORS BY ECONOMIC ACTIVITY (NACE - 2814), 2016



Main goods exported by CPA, 2008

Code	Description	SHARE
28	Machinery and equipment n.e.c.	93,17%
25	Fabricated metal products, except machinery and equip.	3,92%
38	Waste collection, treatment and disposal services; mate	1,06%
24	Basic metals	1,06%
23	Other non-metallic mineral products D	0,68%

TOP EXPORTERS

- 1st - Company real name
- 2nd - Company real name
- 3rd - Company real name
- 4th - **COMPANY TEST NAME**
- 5th - Company real name
- ...

SHARE of company exports in the economic activity
12,3%



Taken from [2] Buiten et al. (2018)

