Tensor Flow + Haskell - > Textiles Imaging + Informatics + QC

Nirmal Tej Kumar

Independent Consultant – Informatics R&D – USA/Brazil/Israel.

Current Member – ante INST UTD Dallas TX USA.

Contact_info – hmfg2014@gmail.com

Abstract :

Exploring & Understanding Basic classification: Classify images of clothing Using Tensor Flow/Haskell/Other related concepts. Advancing Image Processing R&D in Textile Industry in the context of Functional Programming.

index words/keywords : Tensor Flow(TF)/Haskell/Textiles/Image Processing/Machine Learning/Informatics.

[I] Main Idea + Inspiration + News from Textile Industry :

Challenges in Textile industry
- Manual inspection systems, data collection and reporting consume a lot of time in process and human errors.

- Sometimes the industry clients are not satisfied enough or trust in the manual reports.

- The cost of defects will be very high if they can only be detected late.

- Using Machine vision only without deep learning in the inspection systems lets it works only for some types of fabric and can't work on types such as patterned and lace.

- Today the industrial enterprises are upgrading to (4 points system) to win competitive advantages such as exporting.

[Source - https://devisionx.com/industrial-applications/textile/]

"The Fashion-MNIST clothing classification problem is a new standard dataset used in computer vision and deep learning.Although the dataset is relatively simple, it can be used as the basis for learning and practicing how to develop, evaluate, and use deep convolutional neural networks for image classification from scratch. This includes how to develop a robust test harness for estimating the performance of the model, how to explore improvements to the model, and how to save the model and later load it to make predictions on new data."

[Source - https://machinelearningmastery.com/how-to-develop-a-cnn-from-scratch-for-fashion-mnist-clothing-classification/]

"Fashion-MNIST is a dataset of Zalando's article images—consisting of a training set of 60,000 examples and a test set of 10,000 examples. Each example is a 28x28 grayscale image, associated with a label from 10 classes. We intend Fashion-MNIST to serve as a direct drop-in replacement for the original MNIST dataset for benchmarking machine learning algorithms. It shares the same image size and structure of training and testing splits."

[Source - https://github.com/zalandoresearch/fashion-mnist]

"To Serious Machine Learning Researchers

Seriously, we are talking about replacing MNIST. Here are some good reasons:

•**MNIST is too easy.** Convolutional nets can achieve 99.7% on MNIST. Classic machine learning algorithms can also achieve 97% easily. Check out our side-by-side benchmark for Fashion-MNIST vs. MNIST, and read "Most pairs of MNIST digits can be distinguished pretty well by just one pixel."

•**MNIST is overused.** In this April 2017 Twitter thread, Google Brain research scientist and deep learning expert Ian Goodfellow calls for people to move away from MNIST.

•**MNIST can not represent modern CV tasks**, as noted in this April 2017 Twitter thread, deep learning expert/Keras author François Chollet."

[Source - https://github.com/zalandoresearch/fashion-mnist]

[II] R&D Image Processing + Informatics Framework Using Tensor Flow +Haskell :

{ Exploring the Fashion MNIST dataset – Using Tensor Flow + Haskell w.r.t Image Classification Techniques – A Simple and Novel Suggestion. }

*** Derive a Simple Framework based on our Works on vixra.org → It is EASY Folks.

https://github.com/tejdnk-2019-ShortNotes.

[III] Important References w.r.t → Haskell + Tensor Flow + Related Mathematics :

[a] https://www.tensorflow.org/

[b] https://www.tensorflow.org/tutorials/keras/classification

[c] https://www.tensorflow.org/tutorials/generative/dcgan

[d] https://www.tensorflow.org/tutorials/text/nmt_with_attention

[e] https://towardsdatascience.com/starting-out-with-haskell-tensor-flow-49ec8aa7697f

[f] https://www.haskell.org/ && https://mmhaskell.com/machine-learning

[IV] Additional Information on Hardware/Software Used/Useful :

[a] https://mmhaskell.com/machine-learning/ai-native

[b] https://www.raspberrypi.org/

[c] https://developer.bosch.com/web/xdk

[d] https://source.android.com/devices/camera/external-usb-cameras

[e] https://www.amazon.com/usb-camera/s?k=usb+camera

[f] https://www.zerynth.com/

[V] Simple R&D Discussion on Image Processing + Informatics in Textile Industry :

"Computers have been in use for textile manufacturing, but its advantages can be taken several steps further by integrating artificial intelligence into the system. While machine learning in the textile industry is still undergoing development, its earlier used cases are already showing significant signs on how they can drastically improve traditional garment manufacturing processes.

The use of AI is the most practical approach to future-proof your fashion business because other industries are also moving toward this direction. Here are some of the applications of artificial intelligence that show how promising the technology is once it reaches maturity "

[Source - https://frontier.cool/blogposts/importance-machine-learning-textile-industry]

"The Hong Kong Polytechnic University recently developed an intelligent fabric defect detection system, called "WiseEye", which leverages advanced technologies including Artificial Intelligence and Deep Learning in the process of quality control in textile industry. The system effectively minimises the chance of producing substandard fabric by 90%, thus substantially reducing loss and wastage in the production. It helps to save manpower as well as enhance the automation management in the textile manufacturing."

[Source - **https://www.electronicspecifier.com/products/artificial-intelligence/ai-powered-system-to-automate-quality-control-process-in-textile-industry**]

[Source - https://www.innovationintextiles.com/new-aipowered-system-to-automate-quality-control-process/]

"Intelligent machine systems and machine learning (ML) are dramatically changing the way we work. The basic concepts have been known for quite some time. As early as 1959, Arthur Samuel introduced the term machine learning as a field of study that gives computers the ability to learn without being explicitly programmed ".

[Source - **https://www.itwm.fraunhofer.de/en/departments/tv/flexible-structures/machine-learning-textile-industry.html**]

Basic Information on Haskell & its Industrial Usage :

"Haskell has a diverse range of use commercially, from aerospace and defense, to finance, to web startups, hardware design firms and a lawnmower manufacturer. This page collects resources on the industrial use of Haskell.

The main user conference for industrial Haskell use is CUFP - the Commercial Users of Functional Programming Workshop.

The Industrial Haskell Group supports commercial users.

There is a well-maintained (as of 2018) github repository that collects information on companies using Haskell.

The commercial Haskell group is a special interest group for companies and individuals interested in commercial usage of Haskell."

[Source - **https://wiki.haskell.org/Haskell_in_industry**]

Simon Peyton Jones – Escape from the Ivory Tower – the Haskell Journey. Lecture on Youtube. Churchill College Cambridge University,UK.

[Source - https://www.youtube.com/watch?v=re96UgMk6GQ]

The papers he most enthusiastically recommends in the talk:

Lambda the Ultimate:

http://library.readscheme.org/page1.html

Why Functional Programming Matters:

https://www.cs.kent.ac.uk/people/staff/dat/miranda/whyfp90.pdf

Comprehending Monads:

https://ncatlab.org/nlab/files/WadlerMonads.pdf

[VI] Conclusion/s With Future Perspectives :

Understanding Textile Industry based Image Processing and Informatics Using Haskell + Machine Learning Algorithms is very much interesting,challenging and promising. Haskell is an excellent tool as FPL- Functional Programming Language in the near future in the context of AI based Solutions. Therefore we present a simple R&D approach to advance research in the Textile Industry. Embedding of Sensors into Textile Materials thus making them intelligent for various applications like Space Military and Medicine require advanced Image Processing Techniques to understand the Textile Fabric Structures based on Nano-Bio Systems. To the best of our knowledge,this is one of the pioneering efforts in this domain.

[VII] Acknowledgment/s :

Sincere Thanks to all WHO made this happen in my LIFE. Non-Profit R&D.
Inspiring Others is always GOOD.

[VIII] References :

[1] https://www.hilarispublisher.com/open-access/digital-image-processing-techniques-a-versatile-system-for-textile-characterization-2165-8064.1000156.pdf - Digital Image Processing Techniques: A Versatile System for Textile Characterization - Singh JP et al.

[2] https://www.fibre2fashion.com/industry-article/1249/application-of-the-image-analysis-technique-for-textile-identification → **Application of the Image Analysis Technique for Textile Identification** By : Robert Drobina, Mieczyslaw S. Machnio Published :Jan 2007

[3] https://www.loginworks.com/blogs/textile-quality-control-is-getting-better-with-image-processing/

[4] https://www.sciencedirect.com/science/article/pii/B9781845696634500188

[THE END]