

A Living Review of Machine Learning for Particle Physics

Ben Nachman ¹ Matthew Feickert ²

¹Lawrence Berkeley National Laboratory

²University of Illinois at Urbana-Champaign

IML Machine Learning Working Group
May 5th, 2020

- ▶ An **always up to date** review of the status of ML literature in the HEP community
- ▶ Provides **most comprehensive** BibTeX file of HEPML work to date
- ▶ Achieved through an IML hosted GitHub repository that builds a website and LaTeX document through Continuous Integration
- ▶ Is rebuilt and distributed with each PR, so should reflect status of the community literature to within a few days

HEPML-LivingReview

A Living Review of Machine Learning for Particle Physics

Modern machine learning techniques, including deep learning, is rapidly being applied, adapted, and developed for high energy physics. The goal of this document is to provide a nearly comprehensive list of citations for those developing and applying these approaches to experimental, phenomenological, or theoretical analyses. As a living document, it will be updated as often as possible to incorporate the latest developments. A list of proper (unchanging) reviews can be found within. Papers are grouped into a small set of topics to be as useful as possible. Suggestions are most welcome.

[download review](#)

The purpose of this note is to collect references for modern categories is chosen in order to be as useful as possible. No paper is listed in this document does not endorse or validate. Furthermore, the classification here is a best attempt and should be included, (b) a paper has been misclassified, or available. In order to be as useful as possible, this document paper.

• Reviews.

◦ Modern reviews

- [Jet Substructure at the Large Hadron Collider](#)
- [Deep Learning and its Application to LHC Physics](#)
- [Machine Learning in High Energy Physics Colliders](#)
- [Machine learning at the energy and intensity frontier](#)
- [Machine learning and the physical sciences](#)
- [The Machine Learning Landscape of Top Tagging](#)

◦ Classical papers

- [Neural Networks and Cellular Automata in Event Reconstruction](#)
- [Finding Gluon Jets With a Neural Trigger](#)

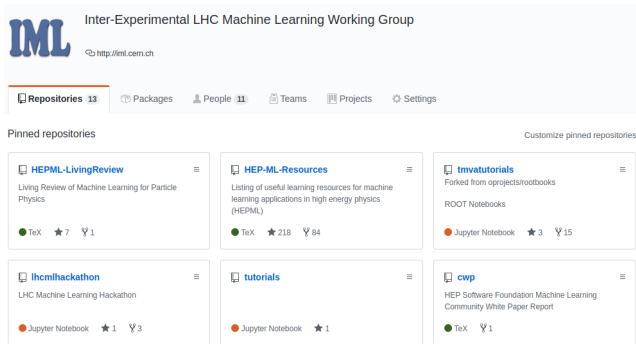
A Living Review of Machine Learning for Particle Physics

ABSTRACT: Modern machine learning techniques, including deep learning, is rapidly being applied, adapted, and developed for high energy physics. The goal of this document is to provide a nearly comprehensive list of citations for those developing and applying these approaches to experimental, phenomenological, or theoretical analyses. As a living document, it will be updated as often as possible to incorporate the latest developments. A list of proper (unchanging) reviews can be found within. Papers are grouped into a small set of topics to be as useful as possible. Suggestions are most welcome.

First Mar 1, 2019 from 070115

Don't we already have one of these?

- ▶ Back in 2017 we made the HEPML Resources repo to be a knowledge repository for HEP ML Work
- ▶ Has been a general success and point of interest
- ▶ However, the most popular part of it was the papers listing and BibTeX file which was slow to get updated
- ▶ The community needs something which is easier to maintain
- ▶ The papers section of the HEMPL Resources page will be migrated and phased out



The screenshot shows the GitHub profile for the Inter-Experimental LHC Machine Learning Working Group (IML). The profile includes a header with the IML logo and the URL <http://iml.cern.ch>. Below the header are navigation tabs for Repositories (13), Packages, People (11), Teams, Projects, and Settings. The main content area is titled "Pinned repositories" and lists six repositories:

- HEPML-LivingReview**: Living Review of Machine Learning for Particle Physics. TeX, 7 stars, 1 fork.
- HEP-ML-Resources**: Listing of useful learning resources for machine learning applications in high energy physics (HEPML). TeX, 218 stars, 84 forks.
- tmvatutorials**: Forked from oprojects/rootbooks. ROOT Notebooks. Jupyter Notebook, 3 stars, 15 forks.
- lhcmihackathon**: LHC Machine Learning Hackathon. Jupyter Notebook, 1 star, 3 forks.
- tutorials**: Jupyter Notebook, 1 star.
- cwp**: HEP Software Foundation Machine Learning Community White Paper Report. TeX, 1 fork.

HEMPL Resources has drawn people from all over the ML community

I want to check this out

- ▶ Easy to find from the [IML GitHub organization](#)
- ▶ GitHub repo is quite new, so can expect changes in the near future
- ▶ Ideas welcome in Issues and contributions in PRs



updating .bib #5

Open cranmer opened this issue 5 days ago · 0 comments



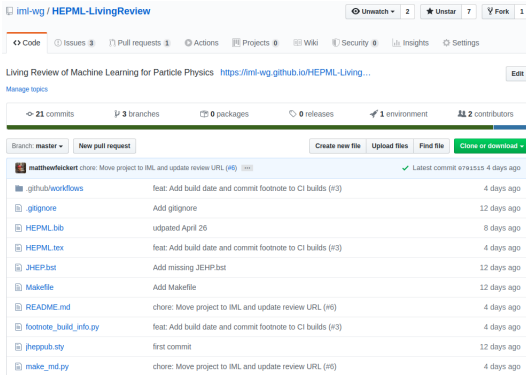
cranmer commented 5 days ago

As papers get accepted to journals and conferences we would like to update the .bib file. In my experience, people are not good about updating this kind of thing, but it's easy to automate it.

I think it would be nice to just have a list of inspire IDs and then hit the API to build the page and build an up-to-date .bib file (similar to what we do for IRIS-HEP web page)



matthewfeickert added the **enhancement** label 5 days ago



iml-wg / HEPML-LivingReview

Code Issues 3 Pull requests 1 Actions Projects 0 Wiki Security 0 Insights Settings

Living Review of Machine Learning for Particle Physics <https://iml-wg.github.io/HEPML-Living...> Edit

Manage topics

21 commits 3 branches 0 packages 0 releases 1 environment 2 contributors

Branch: master New pull request Create new file Upload files Find file Clone or download

matthewfeickert chore: Move project to IML and update review URL (#6)	Latest commit 67a5155 4 days ago
.github/workflows	feat: Add build date and commit footnote to CI builds (#3) 4 days ago
.gitignore	Add gitignore 12 days ago
HEPML.bib	updated April 26 8 days ago
HEPML.tex	feat: Add build date and commit footnote to CI builds (#3) 4 days ago
JHEPbst	Add missing JHEPbst 12 days ago
Makefile	Add Makefile 12 days ago
README.md	chore: Move project to IML and update review URL (#6) 4 days ago
footnote_build_info.py	feat: Add build date and commit footnote to CI builds (#3) 4 days ago
jheppub.sty	first commit 12 days ago
make_md.py	chore: Move project to IML and update review URL (#6) 4 days ago

GitHub repo powering review and awaiting your contributions

- ▶ Check out the [CONTRIBUTING.md](#) on GitHub for more information and FAQs
 - ▶ **Contributions welcome!**
- ▶ Contact the maintainers: [Ben Nachman](#) and [Matthew Feickert](#) (email or GitHub)