KOREAN GRAVITATIONAL WAVE GROUP

Status of KGWG-KAGRA DetChar Activities

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On behalf of KGWG-Detchar Working Group

2016. 12. 7 - 8
KAGRA F2F Meeting @ U. of Tokyo

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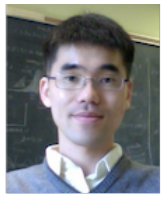
John J. OH (NIMS)
CAGMon/ Deep Learning / EtaGen



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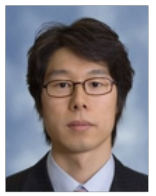


Hwansun KIM (NIMS)
Deep Learning/ CAGMon / EtaGen

Project Milestones

- **EtaGen :** An Event Trigger Generator based on Hilbert-Huang Transform

  To find almost all the injections or transient signals in the time series data

- **CAGMon :** A Detchar Tool via Correlation Scores

  To clarify the correlation between auxiliary channels and GW channels in order to find any nonlinear couplings that may be harmful to detect a signal

- **Safe Channel Study**

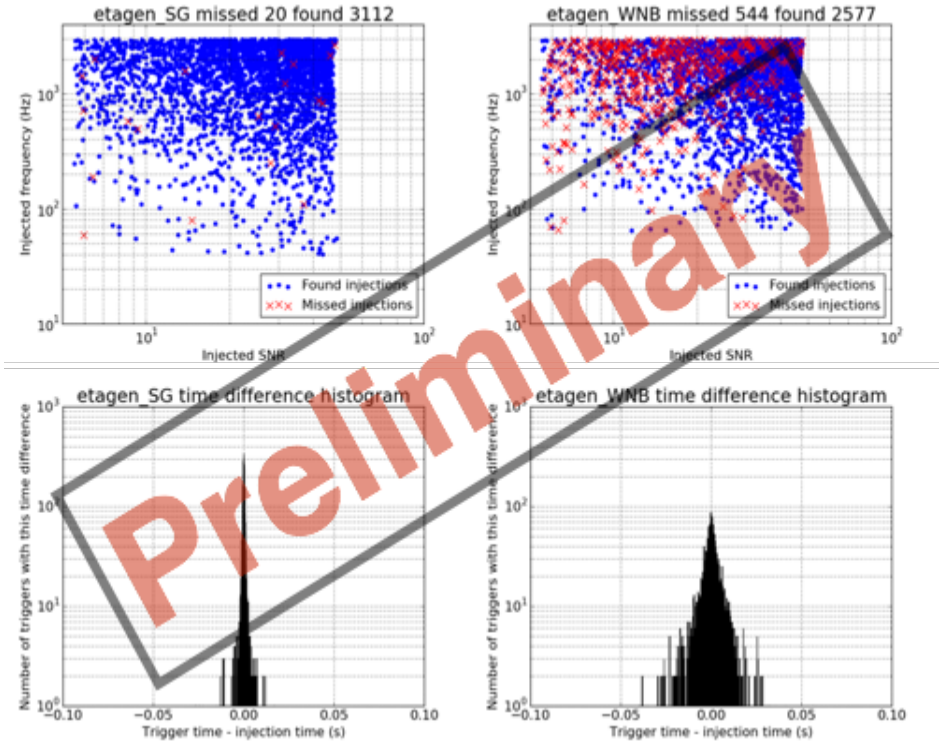
  To figure out uncorrelated or weakly correlated auxiliary channels to hardware injections in h(t) in order to use for investigation on detector characterization

- **Machine Learning for Glitch Classification**

  To classify glitches by using morphology in h(t) and auxiliary channels and to figure out which auxiliary channels are responsible for glitch appearance

Status Report I – EtaGen (η-Gen)

- EtaGen is an event trigger generator based on Hilbert-Huang Transform.
- The efficiency of EtaGen finding simulated sine-Gaussian and white noise burst signals are over 90%.
- Triggers generated near the injection times will be used in the further analyses, e.g., finding safe/unsafe auxiliary channels.



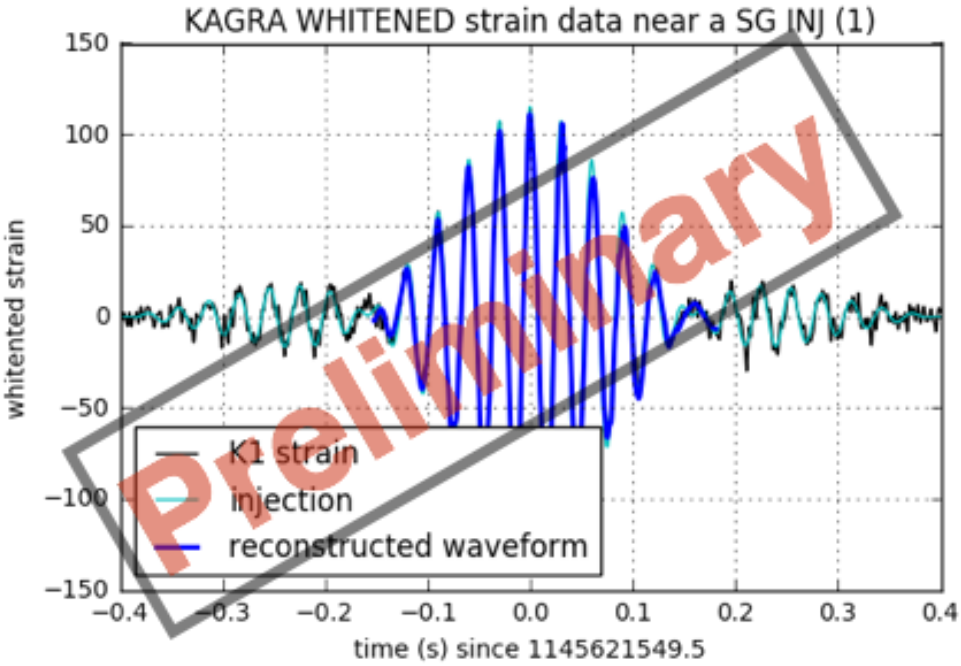
Status Report I – EtaGen (η-Gen) (contd.)

• EtaGen is currently a test version and not released to the public.

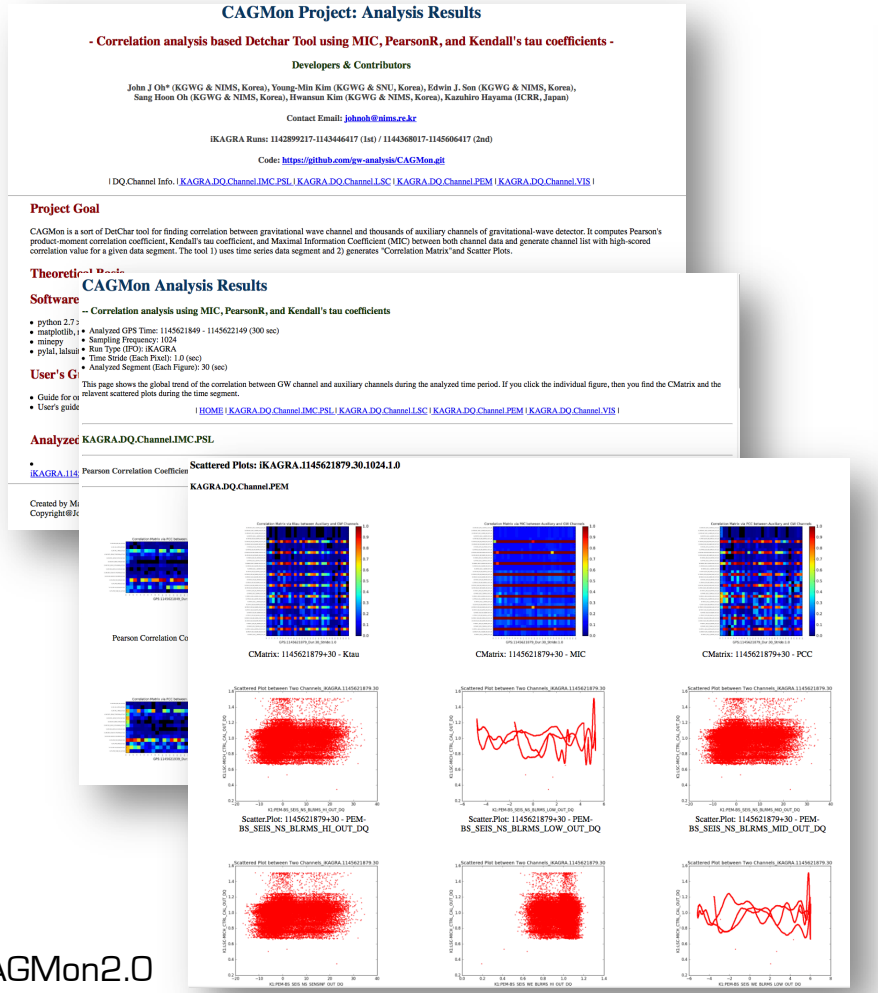
• The user inferface is almost fixed and a hands-on tutorial will be given at the Boot Camp on Dec. 9.

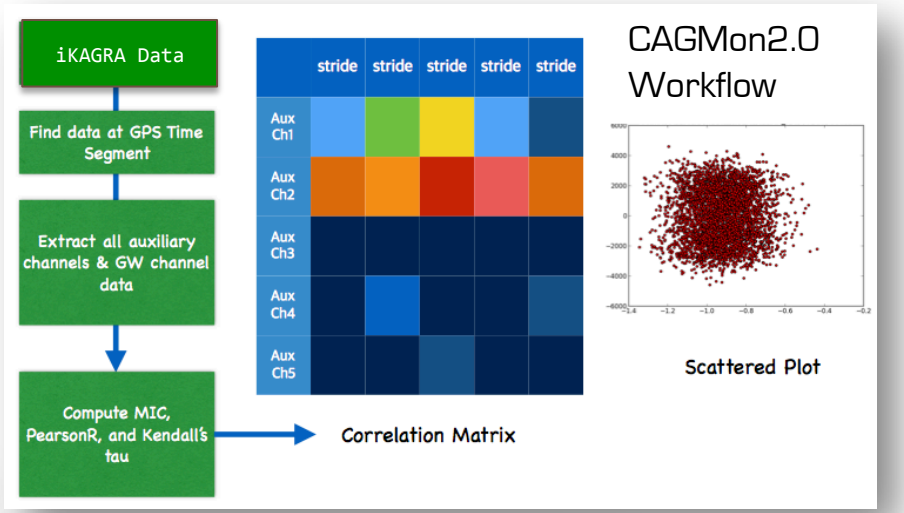
• After some tedious works on bug-fixing, it will be released with a paper.

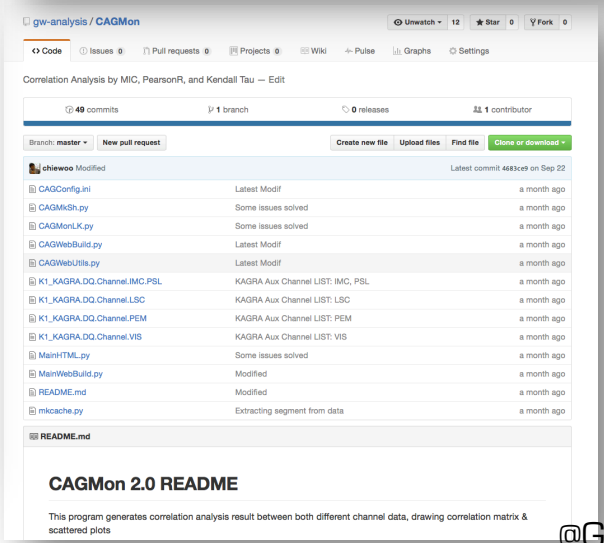
• One more thing. In addition to ETG functions, EtaGen can now reconstruct waveforms.



Status Report II - CAGMon



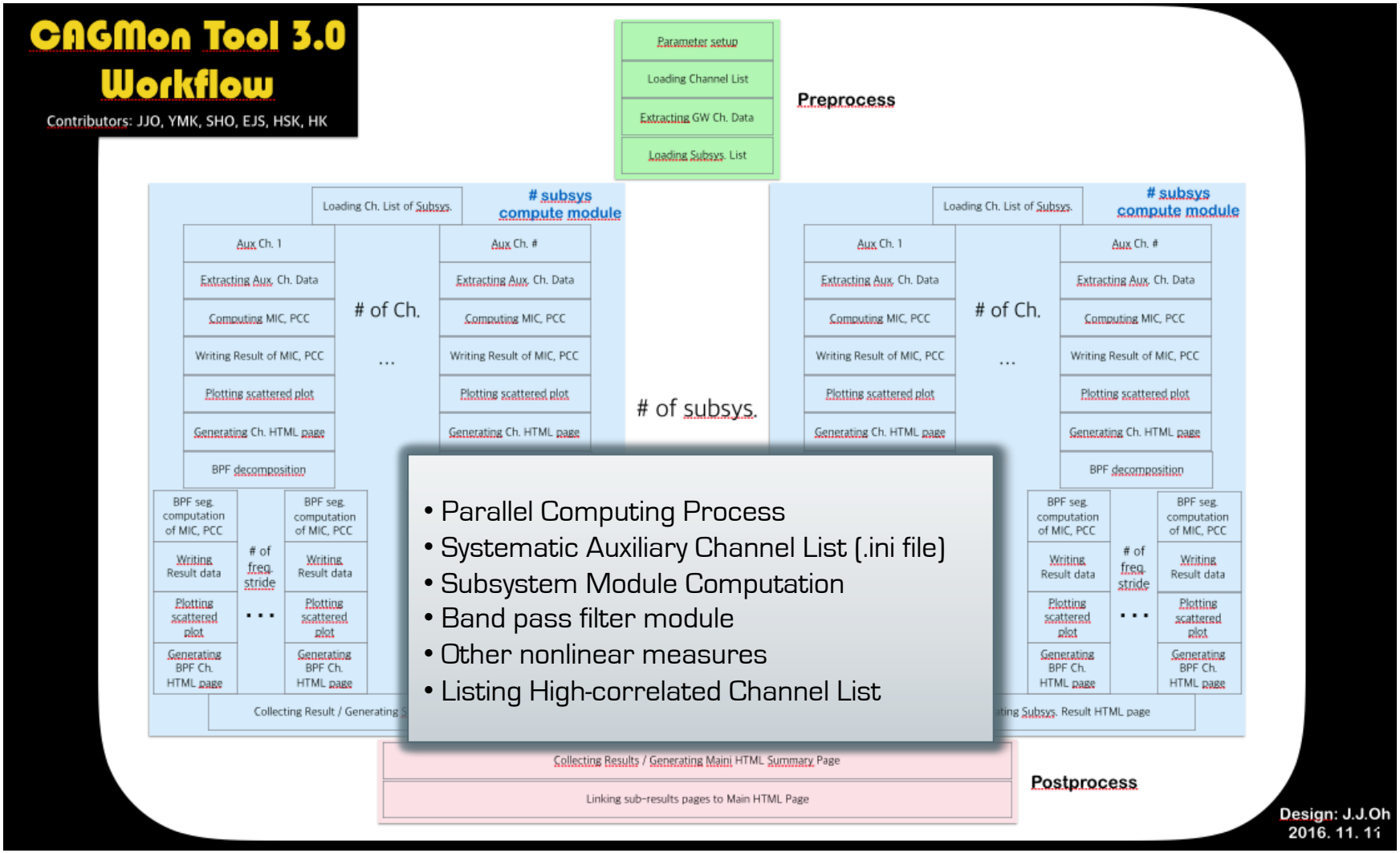




CAGMon2.0
Summary Page
http://seikai.icrr.u-tokyo.ac.jp/~johnoh/

CAGMon2.0
Code Release
@GitHub.KAGRA-Detchar

Status Report II – CAGMon (contd.)



Timeline - CAGMon

Year	2016		2017									
Month	11	12	1	2	3	4	5	6	7	8	9	10
Code Devel	Channel List I/O Code	High Scored Channel List Extract Module	Trigger-based Code (tCAG)	Time-series Code Review			sCAGMon Frozen (Serial CAGMon)	Code Optimization	Parallelize	Parallelize	Code Frozen	pCAGMon Frozen (Parallel CAGMon)
Interface					Summary Page Interface Modify	Interact. Page for tCAG					Interface Frozen	
Build/ Documentation					Package Build	Documentation				Parallel Package Build	Documentation Frozen	
Test Run	Test In LLO/LHO	Test in LLO/LHO	Test in ICRR	Test in ICRR	Test in LLO/LHO ICRR	Test in ICRR	Run in ICRR	Test in ICRR	Test in ICRR	Test in ICRR	Installation in KAGRA Server	Run in ICRR

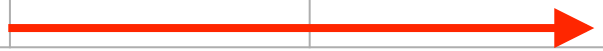
- Current summary page and example runs: http://seikai.icrr.u-tokyo.ac.jp/~johnoh/

Timeline - EtaGen

Oct	Nov	Dec and after (2017)
Current version of EtaGen (Python core) is already installed in /home/eddy	New EtaGen module (C++ core) will be installed in /home/eddy (It can be installed in /home/detchar if requested)	Fine-tuning and upgrades

- Preliminary results in http://seikai.icrr.u-tokyo.ac.jp/~eddy/etagen_list.html

Timeline - Safe Channel Study

<table>
<tr><th></th><th>Nov. 2016</th><th>Dec. 2016</th><th>Jan. 2017</th><th>Feb. 2017</th><th>Mar. 2017</th></tr>
<tr><td>Trigger based</td><td colspan="3">hVeto onto Omicron Triggers:
Code Development for KAGRA and its Test Runs</td><td rowspan="2">Categorizing Safe/ Unsafe Channels:
Comparison between hVeto and CAGMon</td><td rowspan="2">  </td></tr>
<tr><td>Correlation based</td><td>Application of CAGMon:
Categorizing Safe/ Unsafe Channels</td><td colspan="2">  </td></tr>
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Timeline - Machine Learning for Glitch Classification

	2017 Feb	2017 Mar.	2017 Apr.	2017 May
Trigger Classification (Tensorflow)	Development of ANN using Tensorflow	Data Preparation using LIGO data Test/Run	Defining ROCs and FOMs Documentation & Code Build	Defining ROCs and FOMs Documentation & Code Build
Channel Analysis	Code development for Analyzing Significant Channels	Test Runs of the Code onto aLIGO / KAGRA	Development of iDQ/ANN interface for KAGRA and its Test Runs	


ありがとうございました
Thank You Very Much