

GW LAB

Amsterdam, July 2023

ADACS
ASTRONOMY DATA AND COMPUTING SERVICES

GWDC
GRAVITATIONAL WAVE DATA CENTRE

OzGrav
ARC Centre of Excellence for Gravitational Wave Discovery

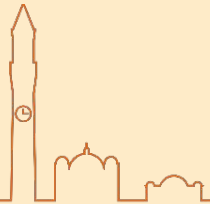
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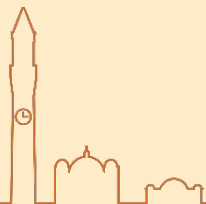
Presented by: Hannah Middleton.
GWLab team: Patrick Clearwater,
Lewis Lakerink, Asher Leslie, Andrew Melatos,
Meg Millhouse, Greg Poole,
Thomas Reichardt



Overview



- Viterbi searches for continuous waves (a short reminder)
- The what and why of GWLab
- Continuous wave searches in GWLab
- Walkthrough
- Feedback very welcome!



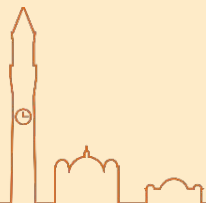
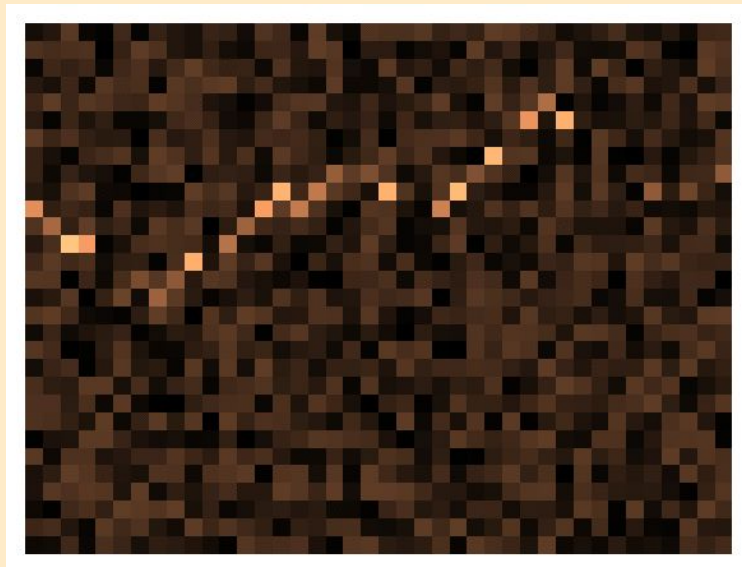
Viterbi searches for continuous waves



Viterbi is one of many search techniques.

Models for the continuous wave frequency to change slightly and randomly over time: *“wandering” frequency.*

Viterbi is able to efficiently track the wandering signal over time.



Viterbi 1967

Viterbi searches for continuous waves



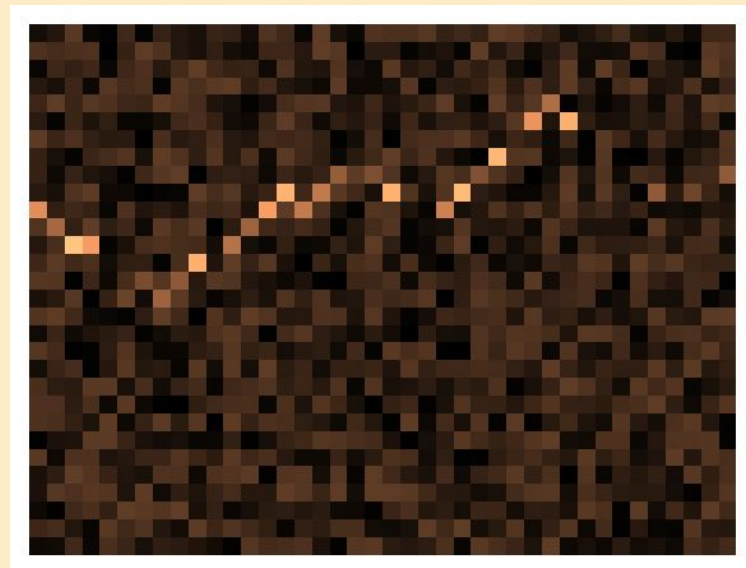
Some Viterbi CW papers:

LVK papers

- GW170817 post-merger remnant <1810.02581>
- O1 Scorpius X-1 search <1704.03719>
- O2 Scorpius X-1 search <1906.12040 >
- O3 Scorpius X-1 <2201.10104>
- O3 Young supernova remnants <2105.11641>
- O3 Accreting millisecond pulsars <2109.09255>

Short-author list papers:

- Suvorova+16,17 <1606.02412><1710.07092>
- Sun+17,19,18 <1710.00460><1810.03577><1903.03866>
- Bayley+19,20,22 <1903.12614><2007.08207><2209.02031>
- Melatos+20 <2107.12822>
- Millhouse+20 <2003.08588>
- HM+20 <2006.06907>
- Jones+20 <2007.08732>



- A virtual laboratory for GW science
- A modular system with the ability to pass results from module to module
- UX designed interface
- Jobs run on OzSTAR

GWLab is a project of the Astronomy Data And Computing Services (ADACS) Gravitational Wave Data Centre (GWDC).

GWLab Team

Project “shepherd”: Andrew Melatos

Science team lead: Meg Millhouse

ADACS GWDC team: Patrick Clearwater, Lewis Lakerink, Asher Leslie, Greg Poole, Thomas Reichardt

Science team members & testers:

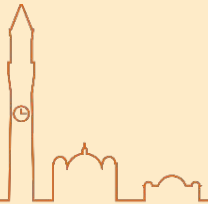
Deeksha Beniwal, Julian Carlin, HM, Lucy Strang, Karl Wette and more!



Why?



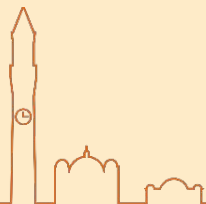
- Lower the barrier to entry for gravitational wave science
- Enable easy data provenance
- Enable easy results sharing



The Viterbi module



- The Viterbi search is the first CW search to be implemented in GWLab - starting with the familiar
- GWLab is designed so that it could be compatible with any CW search method



Logging into GWLab



The screenshot shows the GWLab login interface. On the left is a decorative graphic of a semi-circle filled with colorful dots. On the right is the login form. A callout box with an orange border and background contains the text: "LVK credentials can be used to login to GWLab" and "or you can make a GWLab account here". Two orange arrows point from this box to the "CONTINUE WITH LIGO AUTHENTICATION" button and the "LOG IN" button respectively.

GWLab

Sign in

[CONTINUE WITH LIGO AUTHENTICATION](#)

Interested in joining the LIGO Scientific Collaboration?
[Apply to join](#)

Continue with your GWLab account

Username

Password

[LOG IN](#)

Need a GWLab account?

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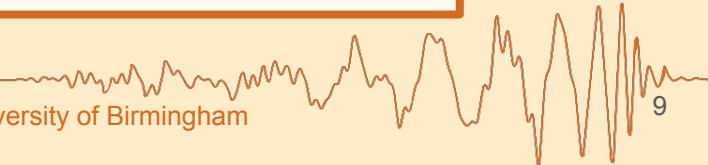
gwlab.org.au



A Viterbi search with GWLab

A screenshot of the GWLab web interface for configuring a new experiment. The page has a light orange header with the GW LAB logo, navigation links for 'Viterbi', 'GWCandidate', and 'CWFollowup', and a user profile for 'Hannah Middleton' with a 'Logout' link. Below the header is a dark orange bar with 'Experiments' and 'New Experiment' links. The main content area is white and contains a form for setting up an experiment. At the top, there's a title 'Untitled' with an 'EDIT' link, followed by a description 'A good description is specific, unique, and memorable.' with another 'EDIT' link. The form is divided into sections: 'DATA SETTINGS' (containing 'Sky position & frequency' and 'F STATISTIC' with a value of 1238166483 and 'GPS' units), 'Binary Orbital PARAMETERS' (containing 'End' with a value of 1254582483 and 'USE DURATION?' with 'GPS' units), 'OUTPUT' (containing 'Duration is 16416000 seconds (190 days).'), and 'REVIEW & SUBMIT' (containing 'Coherence (drift) time' with a value of 864000 and 'Seconds' units). A note at the bottom of the form says '19 blocks.' There is an orange button labeled 'F STATISTIC >' in the bottom right corner of the form area.

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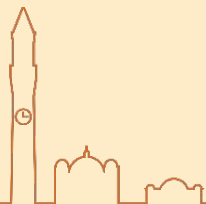


Next steps

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- More modules:
 - **GWCandidate**: for storing and sharing CW search candidates
 - **CWFollowUp**: for following up candidates, e.g. vetoes



Thank you!

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Let us know what
you think!
Any & all feedback welcome

