

Assignment Project Exam Help

<https://eduassistpro.github.io/>

Add WeChat edu_assist_pro

L5b --- Example sequential test

Detection of Marine Sensor Biofouling

Antonio Baptista, Cynthia Archer, Haiming Zheng

Assignment Project Exam Help

<https://eduassistpro.github.io/>

Add WeChat edu_assist_pro

Conductivity Sensor Biofouling

CT1448, 9/28/01

Assignment Project Exam Help

<https://eduassistpro.github.io/>

CT1459, 9/30/02

Add WeChat edu_assist_pro

CT1449, 8/28/01

Conductivity Sensor Biofouling

CT1448, 9/28/01

Assignment Project Exam Help

<https://eduassistpro.github.io/>

CT1459, 9/30/02

Add WeChat edu_assist_pro

CT1449, 8/28/01

Biofouling Detection

- Detect onset of biofouling within several diurnal cycles
- Challenges
 - Variability of fouling signature
 - Very few electrodes (many days of lost conductivity) – can't use clean/fouled discriminator
 - Distinguish natural variability from degradation

Assignment Project Exam Help

<https://eduassistpro.github.io/>

Add WeChat edu_assist_pro

Detection Algorithm

Sequential likelihood ratio test

$$h(Now) = \sum_{n=Now-\tau}^{Now} \ln \frac{p(x_n \mid T_n, \text{fouled})}{p(x_n \mid T_n, \text{clean})} \begin{matrix} > \\ < \end{matrix} \lambda$$

Now is current time

Now- τ is start of fouling

x_n is salinity at time n

T_n is vector of local water temperatures at n

λ is detection threshold (set by specifying *false alarm rate*)

<https://eduassistpro.github.io/>

Add WeChat [edu_assist_pro](#)

$p(x/clean)$ is Gaussian with mean $E[s|T]$ dependent on observed tidal variation of *local temperature* (i.e. predict salinity from temperature) and variance $\text{var}(s|T)$

$p(x/fouled)$ is Gaussian with mean *decreasing linearly* (slope m).

Example of On-Line Detector Signals

Assignment Project Exam Help

<https://eduassistpro.github.io/>

Add WeChat edu_assist_pro

Impact and Further Development

- Initial detectors placed on-line in spring of 2001.
- Detectors eventually placed at all observing sites.
- Data Preservation
 - Prior to the deployment (four years of data from 1997 through the salinity sensors suffered a fouling.
 - Post-deployment (01 through February 2003), data loss due to bio fouling peaked to 35%. This includes delays in responding to event detection.
 - If all sensors were attended to immediately following a detected event, the data loss would have dropped to 17%.
 - DETECTORS CUT CORIE BIOFOULING-INDUCED DATA LOSS IN HALF

Impact and Further Development

- One false alarm due to precipitation; one unexplained false alarm.

Assignment Project Exam Help

- Seasonal temperature predictive models at different years of year.
– We developed mixture models for prediction that automatically adjust to current temperature profile conditions in the river-estuary-ocean system.

References

Leen, T.K.; Archer, C; Baptista, A. Parameterized Novelty Detector for Environmental Sensor Monitoring. *Advances in Neural Information Processing Systems 16*, Thrun, Saul, and Scholkopf (eds.), The Mit Press, 2004. **Assignment Project Exam Help**

Archer, C; Baptista, <https://eduassistpro.github.io/> for salinity sensors in the Columbia River Estuary. *Water Research*, **39**, 1060, 2003. **Add WeChat edu_assist_pro**

Assignment Project Exam Help

<https://eduassistpro.github.io/>

Add WeChat edu_assist_pro