

# Detect a premature crack and bending on a PVC water pipe section using differential hoop strain



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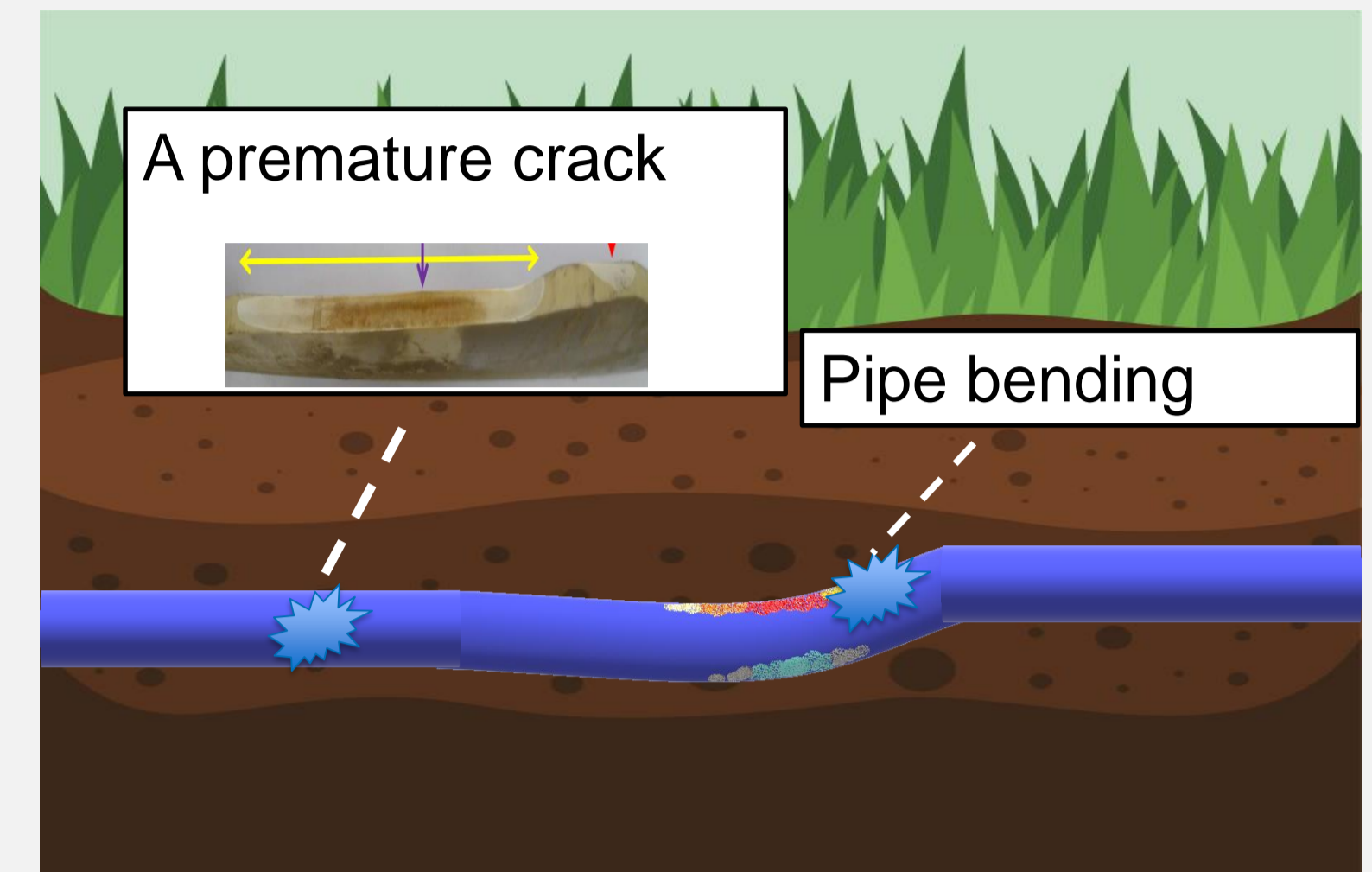
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## Introduction

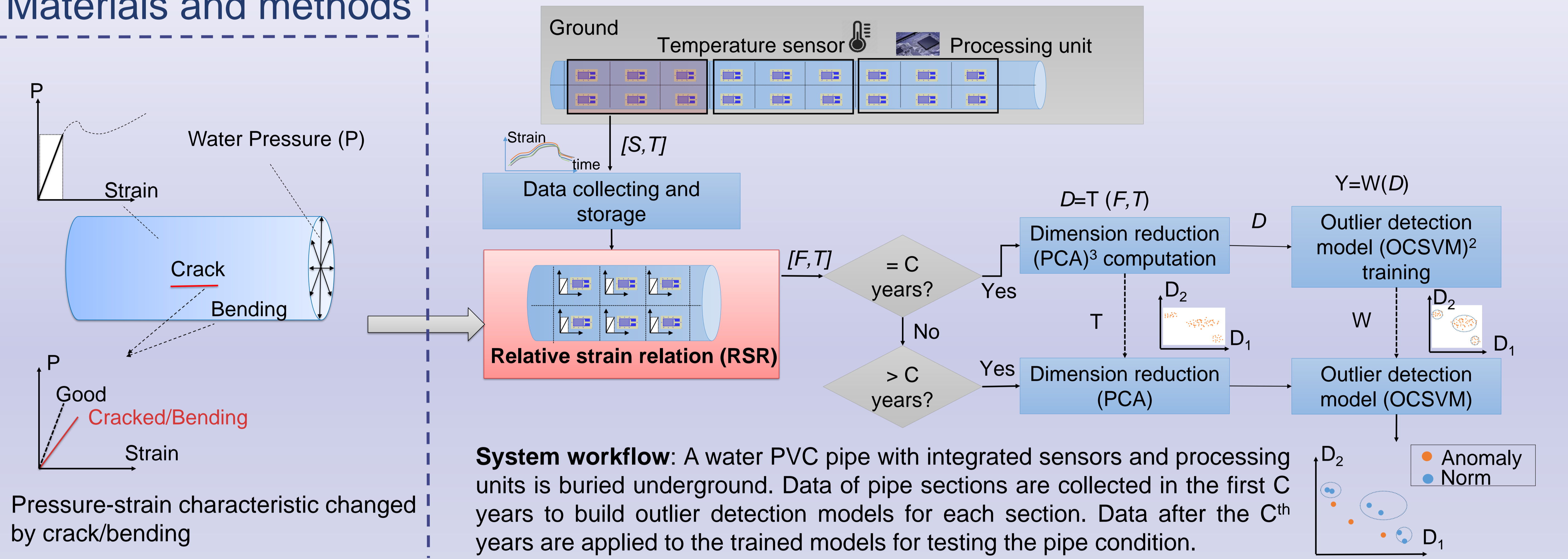
A premature crack and bending indicate impending failures of a PVC water pipe. A pipeline with integrated sensors can detect the defects early and help the water utilities to replace such pipes before breaking.

## Aim of the study

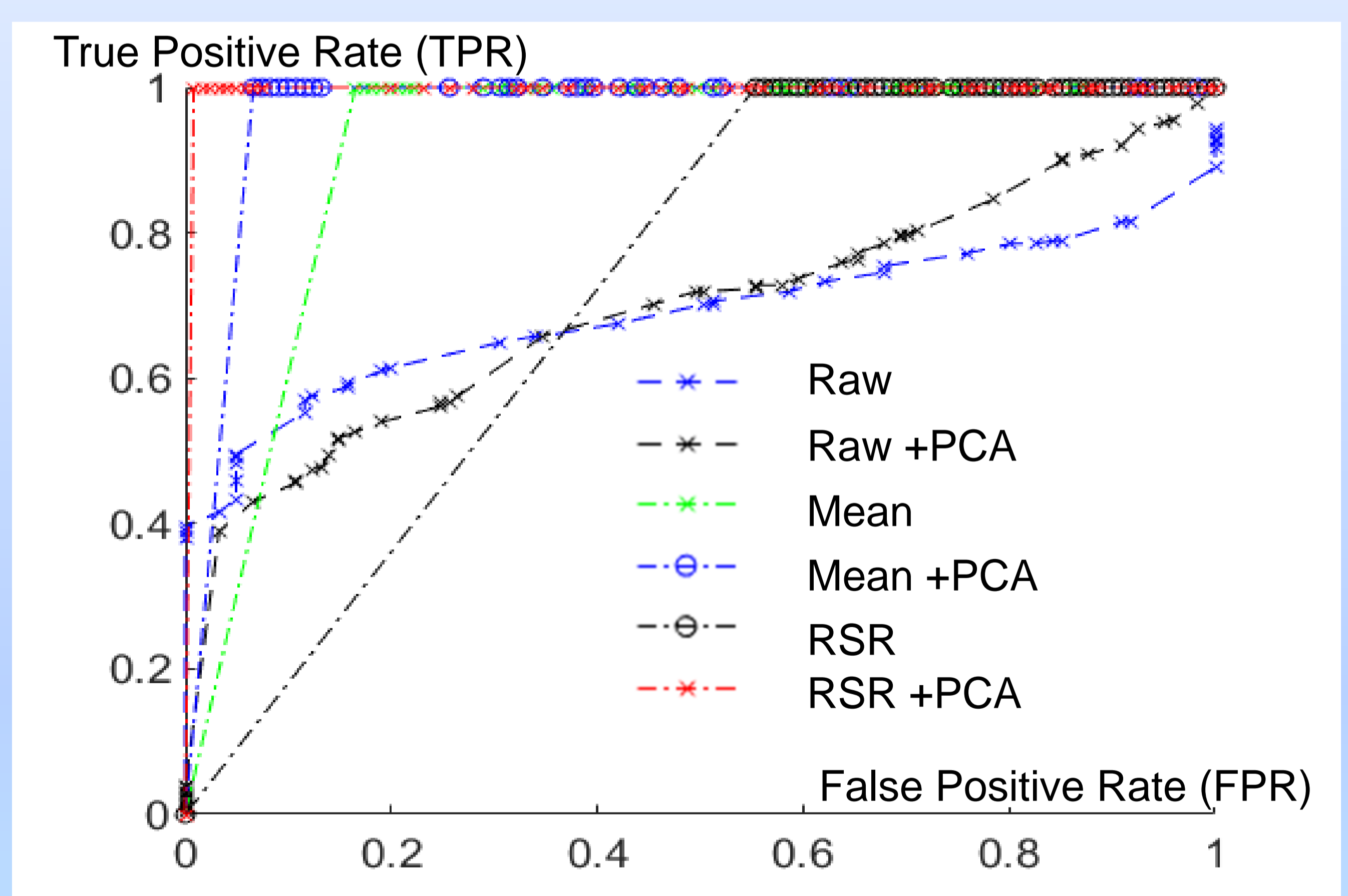
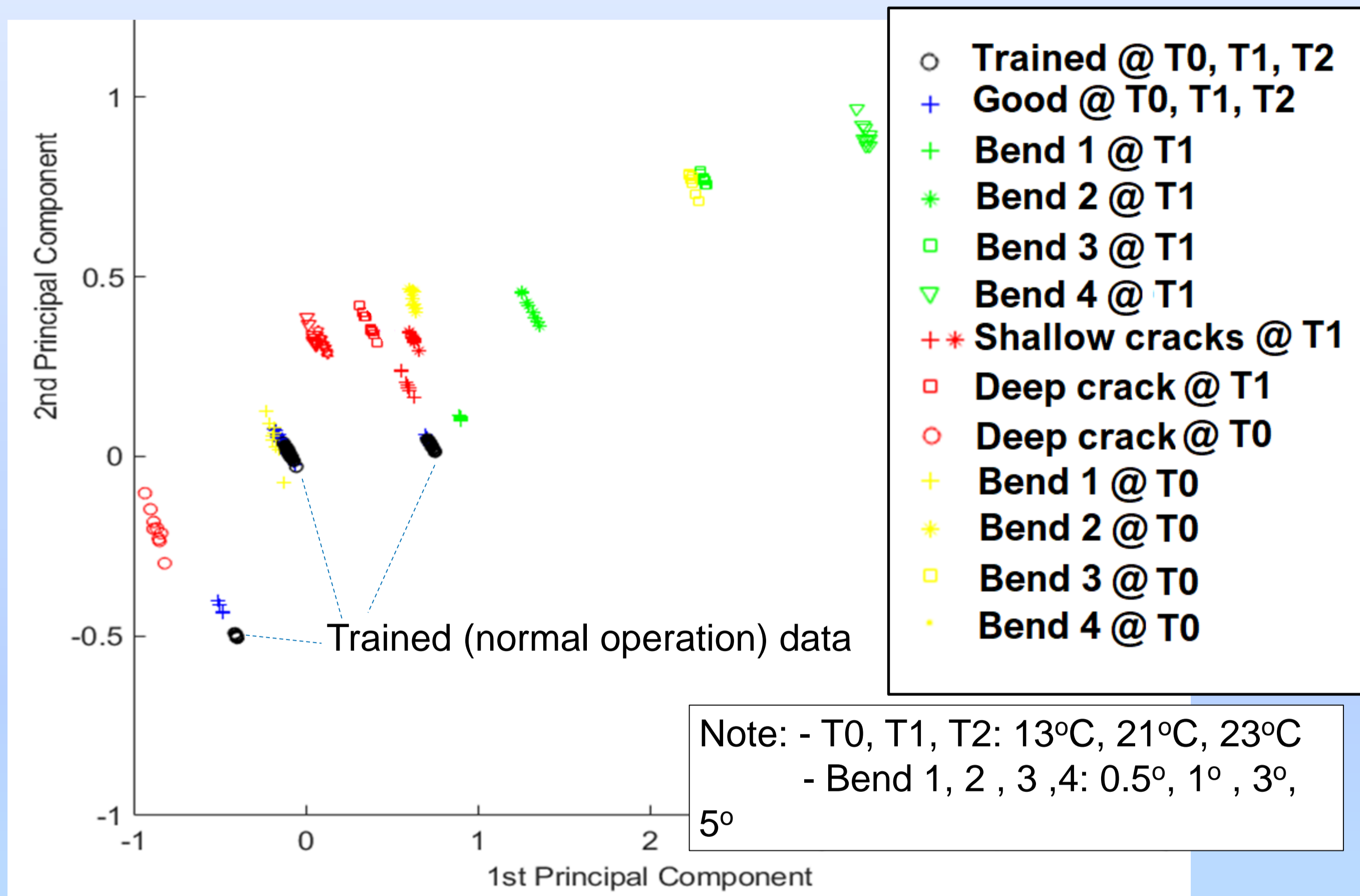
Detect the existence of premature crack and/or bending on a PVC water pipe section using differential hoop strain measured by strain gauges bonded on the pipe wall.



## Materials and methods



## Results



Data of cracks and bending types are separated from the good ones (marked black circle and blue plus) using **RSR + PCA**.

**RSR + PCA + OCSVM** can detect a crack and bending on a pipe section efficiently with  $TPR=1$  and  $FPR=0.996$

## Conclusion

- A strain gauge array can detect a crack and/or bending on a section of a PVC water pipe by using OCSVM outlier detection.
- RSR feature extraction combined with PCA improve the result of OCSVM significantly.
- Crack and bending can not be discriminated yet in this study with only one pipe section but can be done by analysing multiple sections in future research.

## Reference

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