

# ISO/IEC 23053:2022-06 (E)

## Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)

---

| <b>Contents</b>    |  | <b>Page</b> |
|--------------------|--|-------------|
| Foreword .....     |  | iv          |
| Introduction ..... |  | v           |
| 1                  | Scope .....                            | 1           |
| 2                  | Normative references .....             | 1           |
| 3                  | Terms and definitions .....            | 1           |
| 3.1                | Model development and use .....        | 1           |
| 3.2                | Tools .....                            | 2           |
| 3.3                | Data .....                             | 2           |
| 4                  | Abbreviated terms .....                | 3           |
| 5                  | Overview .....                         | 4           |
| 6                  | Machine learning system .....          | 4           |
| 6.1                | Overview .....                         | 4           |
| 6.2                | Task .....                             | 5           |
| 6.2.1              | General .....                          | 5           |
| 6.2.2              | Regression .....                       | 6           |
| 6.2.3              | Classification .....                   | 6           |
| 6.2.4              | Clustering .....                       | 6           |
| 6.2.5              | Anomaly detection .....                | 6           |
| 6.2.6              | Dimensionality reduction .....         | 7           |
| 6.2.7              | Other tasks .....                      | 7           |
| 6.3                | Model .....                            | 7           |
| 6.4                | Data .....                             | 8           |
| 6.5                | Tools .....                            | 9           |
| 6.5.1              | General .....                          | 9           |
| 6.5.2              | Data preparation .....                 | 9           |
| 6.5.3              | Categories of ML algorithms .....      | 10          |
| 6.5.4              | ML optimisation methods .....          | 14          |
| 6.5.5              | ML evaluation metrics .....            | 16          |
| 7                  | Machine learning approaches .....      | 19          |
| 7.1                | General .....                          | 19          |
| 7.2                | Supervised machine learning .....      | 20          |
| 7.3                | Unsupervised machine learning .....    | 22          |
| 7.4                | Semi-supervised machine learning ..... | 23          |
| 7.5                | Self-supervised machine learning ..... | 23          |
| 7.6                | Reinforcement machine learning .....   | 23          |
| 7.7                | Transfer learning .....                | 24          |
| 8                  | Machine learning pipeline .....        | 25          |
| 8.1                | General .....                          | 25          |
| 8.2                | Data acquisition .....                 | 26          |
| 8.3                | Data preparation .....                 | 27          |
| 8.4                | Modelling .....                        | 28          |
| 8.5                | Verification and validation .....      | 30          |
| 8.6                | Model deployment .....                 | 30          |

|   |   |    |
|---|---|----|
| 8.7   | Operation .....   | 30 |
| 8.8   | Example machine learning process based on ML pipeline ..... | 31 |
| Annex A (informative) Example data flow and data use statements for supervised learning process ..... |   | 34 |
| Bibliography .....  |   | 36 |