Curriculum Standard and Certification on Data Science at IPSJ

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Chair at IPSJ Committee on Data Science Education
Co-Chair at IPSJ Working Group on Data Science Certification

- Published IPSJ Curriculum Standard on Data Science on April 2021.
- Accredited Data Science Certification at Hitach co. ltd on September 2021.
DS Curriculum Development Policy

Covers a wide area of Data Science to ensure international compatibility

- ACM Data Science Curriculum
- Edison Data Science Framework

Collaboration with IPSJ Data Science Certification

- Data Scientist Skill Checklist (developed by Japan Data Scientist Society)

Specify Knowledge and Skill required of the Students Majored in Data Science

Curriculum Size ~ Approx. 675 Class Hours

- 50% of the required credits to graduate Japanese universities

Prerequisite: DS Model Curriculum (Literacy Level)
Characteristics of the Reference Models

ACM DS Curriculum
- Detailed Educational Topics Defined
- Priority of Topics: T1, T2, E
- Missing Areas

Edison DS Framework
- Covers the Widest Areas
- ECTS Assigned
- Detailed Topics not Defined

DS Skill Checklist
- Focused on Detailed Skills
- Prepared for Data Scientist
- Contains Business Skill

T1: Required Topic (100%)
T2: Required Topic (80%)
E: Elective Topic (50%)

Mapping of the Three Reference Models
Comprehensive Curriculum having all Advantages
## Organization of the IPSJ DS Curriculum

<table>
<thead>
<tr>
<th>Top Level Category</th>
<th>T1</th>
<th>T2</th>
<th>E</th>
<th>Total</th>
<th>Effective Time (h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Mathematical Fundamentals and Statistics</td>
<td>18.25</td>
<td>19.00</td>
<td></td>
<td>37.25</td>
<td>27.75</td>
</tr>
<tr>
<td>B1: Data Mining</td>
<td>28.00</td>
<td>36.00</td>
<td>78.00</td>
<td>142.00</td>
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</tr>
<tr>
<td>B2: Artificial Intelligence</td>
<td>3.25</td>
<td>17.00</td>
<td>12.50</td>
<td>32.75</td>
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</tr>
<tr>
<td>B3: Machine Learning</td>
<td>13.75</td>
<td>19.50</td>
<td>13.50</td>
<td>46.75</td>
<td>36.10</td>
</tr>
<tr>
<td>C: Modeling and Simulation</td>
<td>11.80</td>
<td>18.38</td>
<td>47.00</td>
<td>77.18</td>
<td>50.00</td>
</tr>
<tr>
<td>D1: Fundamental Computer Science</td>
<td>81.16</td>
<td>22.50</td>
<td>26.25</td>
<td>129.91</td>
<td>112.28</td>
</tr>
<tr>
<td>D2: Big Data System</td>
<td>7.00</td>
<td>59.50</td>
<td>47.00</td>
<td>113.50</td>
<td>78.10</td>
</tr>
<tr>
<td>E1: Security and Privacy</td>
<td>41.93</td>
<td>4.00</td>
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<td>45.93</td>
<td>43.93</td>
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<tr>
<td>F: Software Engineering</td>
<td>50.50</td>
<td>25.00</td>
<td>38.00</td>
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<tr>
<td>G1: Data Collection, Management and Governance</td>
<td>27.01</td>
<td>25.67</td>
<td>17.00</td>
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<tr>
<td>G3: Business Fundamentals</td>
<td>10.50</td>
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<td>8.33</td>
<td>18.83</td>
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<td><strong>Total</strong></td>
<td>326.12</td>
<td>235.55</td>
<td>318.57</td>
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Certified IT Professional (CITP Certification)

Levels in ITSS

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>ITSS</th>
<th>SFIA</th>
<th>e-CF</th>
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</thead>
<tbody>
<tr>
<td>Level 1</td>
<td>Entry</td>
<td>Lv. 1</td>
<td>Lv. 1</td>
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<tr>
<td>Level 2</td>
<td>Middle</td>
<td>Lv. 2</td>
<td>Lv. 2</td>
<td>Lv. 2</td>
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<tr>
<td>Level 3</td>
<td>Super High</td>
<td>Lv. 3</td>
<td>Lv. 3</td>
<td>Lv. 3</td>
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<tr>
<td>Level 4</td>
<td>High</td>
<td>Lv. 4</td>
<td>Lv. 4</td>
<td>Lv. 4</td>
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<tr>
<td>Level 5</td>
<td>High level knowledge and skill</td>
<td>HIGH</td>
<td></td>
<td></td>
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<tr>
<td>Level 6</td>
<td>Domestic high-end player</td>
<td></td>
<td></td>
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<tr>
<td>Level 7</td>
<td>Domestic high-end player and world class player</td>
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</tbody>
</table>

~ 10K Certification Holders

CITP
Feb 2018 Accredited

Japan IT Engineer Examination

JITEE-IP
JITEE-AP
JITEE-FE
JITEE (advanced)
IPSJ Data Science Framework

<table>
<thead>
<tr>
<th>e-CF</th>
<th>SFIA</th>
<th>ITSS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lv. 3</td>
<td>Lv. 5</td>
<td>Lv. 4</td>
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<tr>
<td>Lv. 4</td>
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<td>Lv. 3</td>
<td>Lv. 2</td>
<td>Lv. 2</td>
</tr>
<tr>
<td>Lv. 1</td>
<td>Lv. 2</td>
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</tr>
<tr>
<td>n/a</td>
<td>Lv. 1</td>
<td>Lv. 1</td>
</tr>
</tbody>
</table>

IPSJ DS Accreditation

Private certification scheme
Apply → Evaluate

- Private DS Certification
- IPSJ DS Curriculum (Advanced Level)
- Consortium for Mathematics and Data Science Education
- DS Model Curriculum (Middle Level)
- DS Model Curriculum (Literacy Level)

IPSJ accredit certification scheme
Apply

In Progress
Topic 1: Current collaboration with other organizations related to DS education and/or DS certification

Tetsuro Kakeshita
Information Processing Society of Japan
Entire Picture of Related Activities and Organizations

IFIP IP3

ISO/IEC JTC1/SC7/WG20

CITP Certification

Data Scientist Certification

Data Science Curriculum

The Institute of Professional Engineers, Japan

ACM Data Science Curriculum

Edison Data Science Framework

Data Scientist Association

IPSJ
• Defines requirements to certification scheme for software engineering and systems engineering professionals
• First ISO conformance standard to define requirements for IT-related certification
Topic 2: Future plan of IPSJ related to DS education and DS certifications

Tetsuro Kakeshita
Information Processing Society of Japan
IPSJ Data Science Strategy

**Concept**

IPSJ will establish a framework for systematic education and certification for advanced IT professionals and contribute to the data-driven society.

**Plan**

- Build a systematic education/evaluation framework for Data Scientists from elementary school students to specialized IT engineers
- Promote inter-university collaboration and sharing of educational contents related to Data Science curriculum standards (University specialized education level)
- Promote utilization and cooperation of related existing activities
- Promote mutual learning of the Data Scientists and social contribution based on engineer ethics including data utilization
IPSJ Data Science Framework

<table>
<thead>
<tr>
<th>e-CF</th>
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<th>ITSS</th>
<th>IPSJ DS Accreditation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lv. 3</td>
<td>Lv. 5</td>
<td>Lv. 4</td>
<td>IPSJ DS Certification</td>
</tr>
<tr>
<td>Lv. 4</td>
<td></td>
<td>Lv. 3</td>
<td>IPSJ DS Curriculum (Advanced Level)</td>
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<tr>
<td>Lv. 3</td>
<td></td>
<td>Lv. 2</td>
<td>Consortium for Mathematics and Data Science Education</td>
</tr>
<tr>
<td>Lv. 1</td>
<td>Lv. 2</td>
<td>Lv. 2</td>
<td>DS Model Curriculum (Middle Level)</td>
</tr>
<tr>
<td>n/a</td>
<td>Lv. 1</td>
<td>Lv. 1</td>
<td>DS Model Curriculum (Literacy Level)</td>
</tr>
</tbody>
</table>

- **Governmental Accreditation Scheme for DS Program (Middle & Literacy Levels)**
- **College Level DS Program**
- **DS Seminar at Industry**
- **Private DS Certification**
- **IPSJ DS Certification**
- **DS Model Curriculum (Middle Level)**
- **DS Model Curriculum (Literacy Level)**