HRM USING AI & DATA SCIENCE

DIPLOMA WALLAH

CSE

Jharkhand University Of Technology (JUT)

UNIT-1 (Talent Acquisition and Recruitment)

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1. Introduction to Talent Acquisition and Recruitment

Definition & importance:

- Talent Acquisition refers to the process of identifying, attracting, assessing, and hiring employees who will meet the current and future needs of an organisation.

- Recruitment is a part of this broader process — it typically involves the sourcing and hiring of candidates for immediate openings.

- In the contemporary context, with global competition for skilled workers and fast-changing technology, organisations are combining HRM (Human Resource Management) with Data Science and AI tools so that recruitment is faster, cheaper, and more effective.

Shift in practice:

- In earlier times, recruitment was mostly manual: job advertisement, receiving CVs, HR screening by human, interviews, selection.

- Now, with AI and Data Science: large volumes of candidate data, online job applications, social media profiles, automated screening, predictive matching — all make the process more complex but more capable.

- For engineering/technical organisations (such as manufacturing, automation firms, software companies) this is especially relevant — they need to hire people with specific technical skills, and AI helps in filtering and identifying those from large pools of applicants.

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2. Role of AI and Data Science in Recruitment

Key technologies:

- **Artificial Intelligence (AI)**: broad term for machines simulating human intelligence (decision making, pattern recognition, language understanding).

- **Machine Learning (ML)**: subset of AI where algorithms learn from data to make predictions or classifications.

- **Natural Language Processing (NLP)**: ability of computers to interpret human (written or spoken) language — useful for reading resumes, job descriptions.

- **Predictive Analytics**: using historical data and statistical models to forecast outcomes (for instance: which candidate will perform well or stay longer).

- **Chatbots & virtual assistants**: for engaging candidates, answering FAQs, scheduling interviews.

Why they matter in recruitment:

- They automate repetitive tasks (e.g., screening 1000+ CVs).

- They reduce time-to-hire (filling roles faster) and cost. For example, research shows significant productivity gains when AI is used in recruitment. (Boston Consulting Group)

- They improve candidate experience (e.g., faster responses, personalised communication) and can improve quality of hires. (IBM)

- Data science allows HR to move from reactive recruitment (just fill current opening) to strategic workforce planning (anticipate future needs based on data).

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3. Analysis of Job Descriptions & Candidate Profiles using AI

Job Description (JD) Analysis:

- Organisations create JDs listing required skills (technical, soft), experience level, qualifications, responsibilities.

- AI tools apply NLP to the text of the JD to extract key requirements: e.g., "Python", "Machine Learning", "3-5 years", "automation environment".

- From these extracted requirements, the system builds a "profile" of the job: skill-map, level, category.

Candidate Profile / Resume Analysis:

- Resumes come in many formats; AI systems parse them (extract education, experience, skills, certifications).

- NLP and ML can recognise synonyms (e.g., "programming in Python", "Python scripting"), context ("worked on ML pipeline"), and rank relevance.

- Candidate profile may also include data from online sources (LinkedIn, GitHub, portfolios) to enrich the picture.

Matching JD & Candidate:

- The system can compare the JD profile and candidate profile and compute a match score. Machine Learning models can be trained on past "successful hires" data (which candidates performed well) to predict new candidate suitability. For example, a study used a neural network to evaluate person-job fit using historical data. (arXiv)

- Skill gap analysis: The system can highlight what the candidate has and what is missing, enabling HR to decide whether to hire and train, or reject.

Example:
Suppose a manufacturing company seeks a "CNC Programmer" with 2 years experience, knowledge of "G-code", "M-code", "CAD/CAM software", and basic "statistical process control".

- AI tool extracts these keywords from JD.

- Candidate A has 3 years in "CNC machining", mentions "G-code generation", "CNC programming on Haas", but no mention of "CAD/CAM".

- Candidate B has 2 years in CNC, mentions "CAD/CAM (Mastercam)", "M-code", "process control" but no "G-code generation".

- The AI tool may score both, highlight Candidate A lacks CAD/CAM, Candidate B lacks G-code but has broader skill-set. HR can decide based on priorities (less training on CAD/CAM vs more training on G-code).

Benefits:

- Speeds up screening from hundreds to a manageable shortlist.

- Minimises human error in missing relevant candidates.

- Enables objective comparison between candidates.

- Lets HR focus on deeper steps (interviews, cultural fit) rather than routine filtering.

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4. Efficient Matching of Qualified Individuals with Open Positions

Matching algorithms and systems:

- Recommendation systems: similar to how e-commerce recommends products, AI recommends candidates for job roles.

- Skill-mapping: Building digital representations (vectors) of jobs and candidates by skills, experience levels, certifications.

- Predictive models evaluate «fit» not just on current role but on future performance and retention. For instance, AI-augmented talent acquisition environments allow forecasting of workforce needs. ([Deloitte](#))

- Talent pools: AI tools identify passive candidates (those not actively applying) who might be a fit, widening the candidate base. ([Vonage](#))

Steps in matching:

1. Build job profile from JD (skills, experience, responsibilities).

2. Build candidate profiles from resumes, portfolios, online presence.

3. Run matching algorithm → produce ranked list of candidates.

4. HR reviews top candidates, selects for next stage (interview).

5. Feedback loop: outcomes (who was hired, who succeeded) feed model to improve future matches.

Example:

A software firm has 5 vacancies for "AI data scientist". Using AI matching, the tool identifies 50 candidates from external databases, scores them, and shortlists the top 10. Among the top 10, 3 have "deep learning in Python", "TensorFlow", 2 have "data analytics + Excel", etc. The firm interviews the 3 stronger candidates first and fills roles faster.

Benefits:

- Better quality hires: the match is more precise, reducing mismatches and early attrition.

- Faster hiring: less time wasted on unsuitable candidates. For example, one source reported AI-powered talent acquisition can cut application review time by ~80%. (HR Executive)

- Data-driven decisions: HR can use analytics (e.g., which skills produce high performance) to refine recruitment strategy.

5. Automating the Initial Screening of Applications

What is screening?

- First step after receiving applications: filter out those who clearly do not meet minimum criteria (education, skills, experience).

- Traditional: HR manually checks each resume—very time-consuming when you have large applicant volumes.

Automation via AI:

- **Resume parsing**: AI extracts structured data from resumes (names, education, work history, skills).

- **Scoring & ranking**: Each candidate receives a score based on how well they fit the job profile. Low–scoring are filtered out automatically.

- **Chatbots / virtual assistants**: These can engage candidates for initial qualifying questions ("Do you have 2 years experience? Are you willing to relocate?", etc). They can also schedule interviews automatically. (IBM)

- **One-way video interviews**: Candidate answers video questions; AI analyses the responses (transcripts, tone, keywords) and

highlights strong/weak candidates. Example: Company HireVue. ([Wikipedia](#))

Example flow:

- Company posts a job. Receives 1000 applications.

- AI tool parses all resumes, builds skills matrices.

- It filters out 700 candidates who do not meet minimum skill/experience.

- Shortlists 300 for scoring; out of those, selects 50 as high-score.

- Chatbot sends 50 candidates for quick video interview; the AI picks top 20 for HR to review.

- HR reviews 20, selects 5 for full interview. Overall time greatly reduced.

Advantages:

- Huge savings in recruiter time and cost.

- Consistency: all resumes screened by same criteria, less error.

- Better candidate experience: quicker responses, clear process.

Caveats (also tie into next section):

- Risk of algorithmic bias (if the training data is biased).

- Candidate may feel process impersonal.

- Important that human oversight remains, especially final decisions.

6. Challenges, Risks & Ethical Considerations

Bias and fairness:

- AI systems are only as good as the data they are trained on. If historical hiring data is biased (e.g., favouring one gender, ethnicity, background), the AI may replicate or even amplify that bias. ([SHRM](#))

- Some candidates feel AI introduces unfairness (for example due to voice/accent recognition, video interview analytics).

- Example: A recent study found that non-native English speakers had higher error rates in AI interview systems. ([The Guardian](#))

Data privacy and transparency:

- Candidate data (resumes, video interviews, online profiles) is sensitive. Organisations must ensure compliance with data protection laws (e.g., GDPR, local Indian laws).

- Candidates often don't know how AI is used in the process; research shows many want transparency. ([JOSH BERSIN](#))

Over-reliance on automation:

- Using AI for everything may lead to loss of human touch — cultural fit, emotional intelligence, team dynamics are harder to gauge purely via AI.

- AI should support HR decision-making, not replace it.

Implementation challenges:

- Initial costs and investments (AI tools, training). ([Boston Consulting Group](#))

- Ensuring integration with existing HR systems.

- Need for HR professionals to build AI literacy (understanding how the tools work, limitations). ([arXiv](#))

Best practices / mitigations:

- Use diverse and representative data when training AI models.

- Audit algorithms regularly for bias and fairness.

- Maintain human oversight (especially final candidate decisions).

- Be transparent with candidates about AI use.

- Secure candidate data and comply with privacy regulations.

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7. Real-world Applications and Case Examples

Applications:

- Many companies now use AI-enabled Applicant Tracking Systems (ATS) which integrate parsing, matching, ranking. ([Wikipedia](#))

- Organisations use generative AI to craft job descriptions, candidate-communications, and onboarding scripts. ([HR Executive](#))

- Predictive analytics used to forecast hiring needs, skill gaps, retention risk.

- Platforms for video interviewing and assessments that include AI-scoring (e.g., HireVue).

Engineering context example:

An engineering manufacturing firm wants to hire "Industrial Automation Engineer" with experience in "PLC programming", "SCADA systems", "robotics integration".

- AI tool helps scan internal and external databases for candidates with those keywords.

- Matches those also who have similar roles in past (robotics line integration in manufacturing).

- The company uses data from its prior hires (which candidates turned out best) to refine scoring.

- The AI also suggests internal employees who may be upskilled for the role (internal mobility) — thereby saving external hiring cost.

Benefits realised:

- Faster filling of roles (critical in manufacturing where downtime is costly).

- Better match reduces attrition (engineer leaves after 6 months = cost).

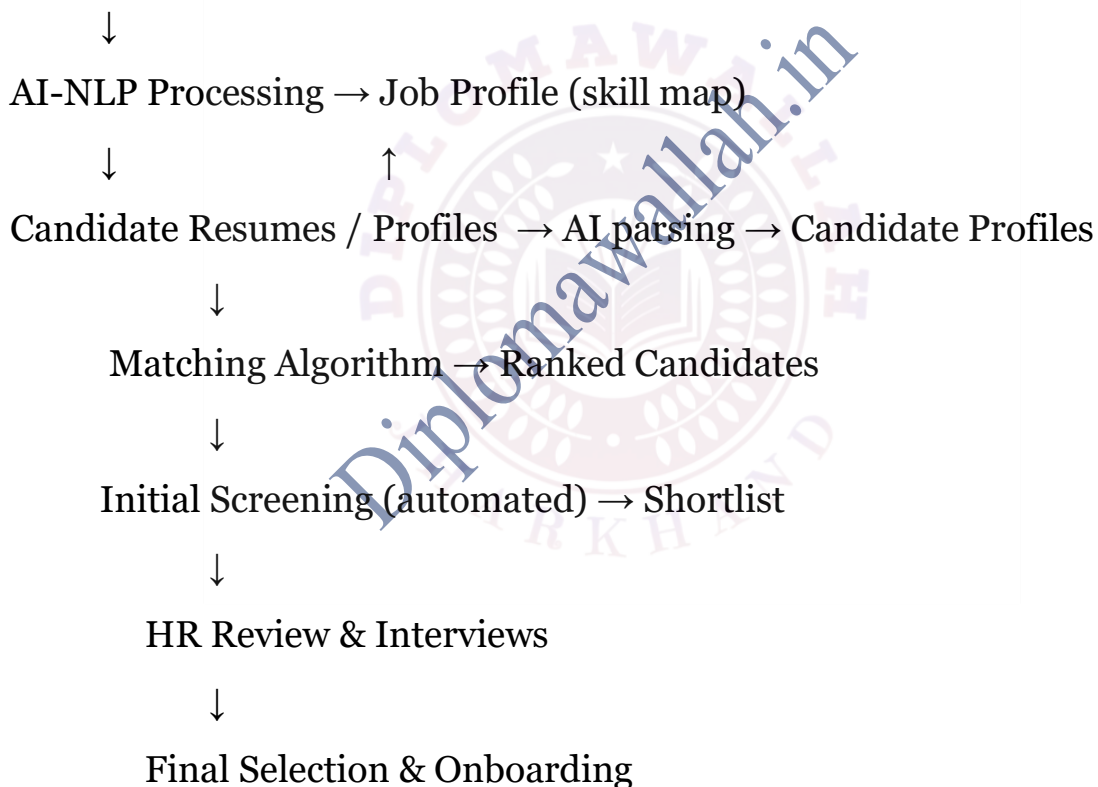- Skills-mapping highlights internal candidates and training needs.

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8. Summary and Key Points for Revision

- Talent acquisition is more than recruitment: a strategic, data-driven process that anticipates and meets organisational talent needs.

- AI and Data Science transform recruitment by automating screening, enhancing matching, enabling predictive insights.

- Example technologies: ML, NLP, chatbots, predictive analytics.

- Key steps: JD & candidate profile analysis → matching → initial screening → HR review → selection.

- Benefits: faster hiring, improved quality of hires, better candidate experience, cost savings.

- Challenges: algorithmic bias, data privacy, over-automation, implementation cost.

- Best practice: balance AI automation with human oversight, ensure fairness and transparency.

9. Diagrams / Conceptual Flow

Job Description (skills, experience, responsibilities)

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AI-NLP Processing → Job Profile (skill map)

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Candidate Resumes / Profiles → AI parsing → Candidate Profiles

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   Matching Algorithm → Ranked Candidates

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Initial Screening (automated) → Shortlist

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   HR Review & Interviews

        ↓

   Final Selection & Onboarding

You may draw this flowchart in your notes, or insert as figure.

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