《Mapping bug reports to relevant files: A ranking model, a fine-grained benchmark, and feature evaluation》	2015	TSE
《Locating bugs without looking back》	2016	MSR
《Information Retrieval and Spectrum Based Bug Localization: Better Together》	2015	FSE/ESEC
《Learning to rank relevant files for bug reports using domain knowledge》	2014	FSE/ESEC
《A Combinatorial Testing-Based Approach to Fault Localization》	2018	TSE

《Mapping bug reports to relevant files: A ranking model, a fine-grained benchmark, and feature evaluation》 2015 TSE
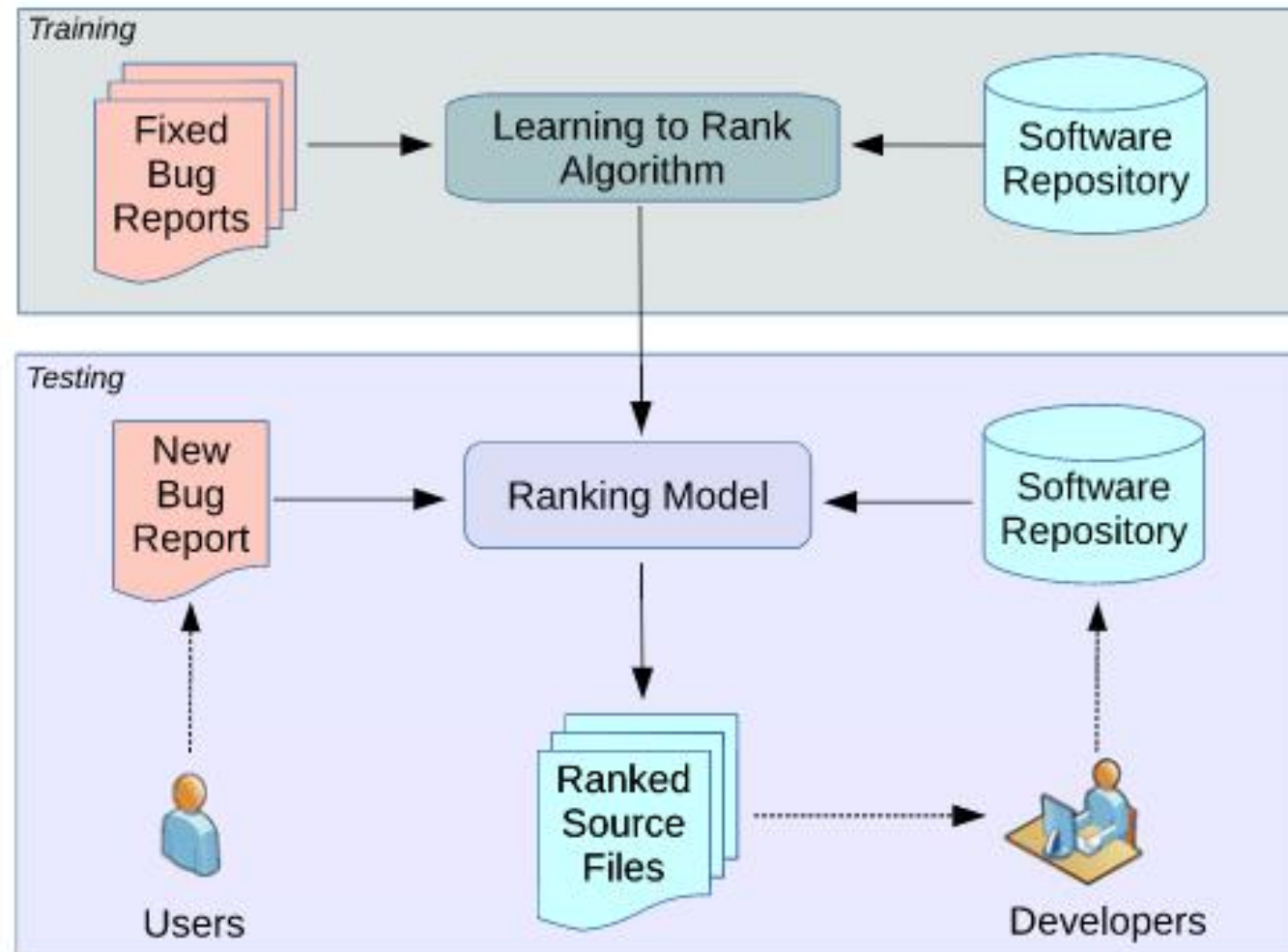

Fig. 1. System architecture for *training* and *testing*.

TABLE 1
Features Used in the Ranking Model

| Feature	Section	Short Description	Formula	Q-Dependent?
ϕ_1	3.1.1	Surface lexical similarity	$\phi_1(r,s) = \max(\{sim(r,s)\} \cup \{sim(r,m)|m \in s\})$	Yes
ϕ_2	3.1.2	API-enriched lexical similarity	$\phi_2(r,s) = \max\{sim(r,s.api)\} \cup \{sim(r,m.api)|m \in s\}$	Yes
ϕ_3	3.2	Collaborative filtering score	$\phi_3(r,s) = sim(r,R(s))$	Yes
ϕ_4	3.3	Class name similarity	$\phi_4(r,s) = |s.class| * \mathbf{1}[s.class \in r.summary]$	Yes
ϕ_5	3.4.1	Bug-fixing recency	$\phi_5(r,s) = (r.month - last(r,s).month + 1)^{-1}$	Yes[†]
ϕ_6	3.4.2	Bug-fixing frequency	$\phi_6(r,s) = |br(r,s)|$	Yes[†]
ϕ_7	3.5	Summary-class names similarity	$\phi_7(r,s) = sim(r.summary, s.class))$	Yes
ϕ_8	3.5	Summary-method names similarity	$\phi_8(r,s) = sim(r.summary, s.method))$	Yes
ϕ_9	3.5	Summary-variable names similarity	$\phi_9(r,s) = sim(r.summary, s.variable))$	Yes
ϕ_{10}	3.5	Summary-comments similarity	$\phi_{10}(r,s) = sim(r.summary, s.comment))$	Yes
ϕ_{11}	3.5	Description-class names similarity	$\phi_{11}(r,s) = sim(r.description, s.class))$	Yes
ϕ_{12}	3.5	Description-method names similarity	$\phi_{12}(r,s) = sim(r.description, s.method))$	Yes
ϕ_{13}	3.5	Description-variable names similarity	$\phi_{13}(r,s) = sim(r.description, s.variable))$	Yes
ϕ_{14}	3.5	Description-comments similarity	$\phi_{14}(r,s) = sim(r.description, s.comment))$	Yes
ϕ_{15}	3.6.1	In-links = # of file dependencies of s	$\phi_{15}(r,s) = s.inLinks$	No
ϕ_{16}	3.6.1	Out-links = # of files that depend on s	$\phi_{16}(r,s) = s.outLinks$	No
ϕ_{17}	3.6.2	PageRank score	$\phi_{17}(r,s) = PageRank(s)$	No
ϕ_{18}	3.6.3	Authority score	$\phi_{18}(r,s) = Authority(s)$	No
ϕ_{19}	3.6.3	Hub score	$\phi_{19}(r,s) = Hub(s)$	No
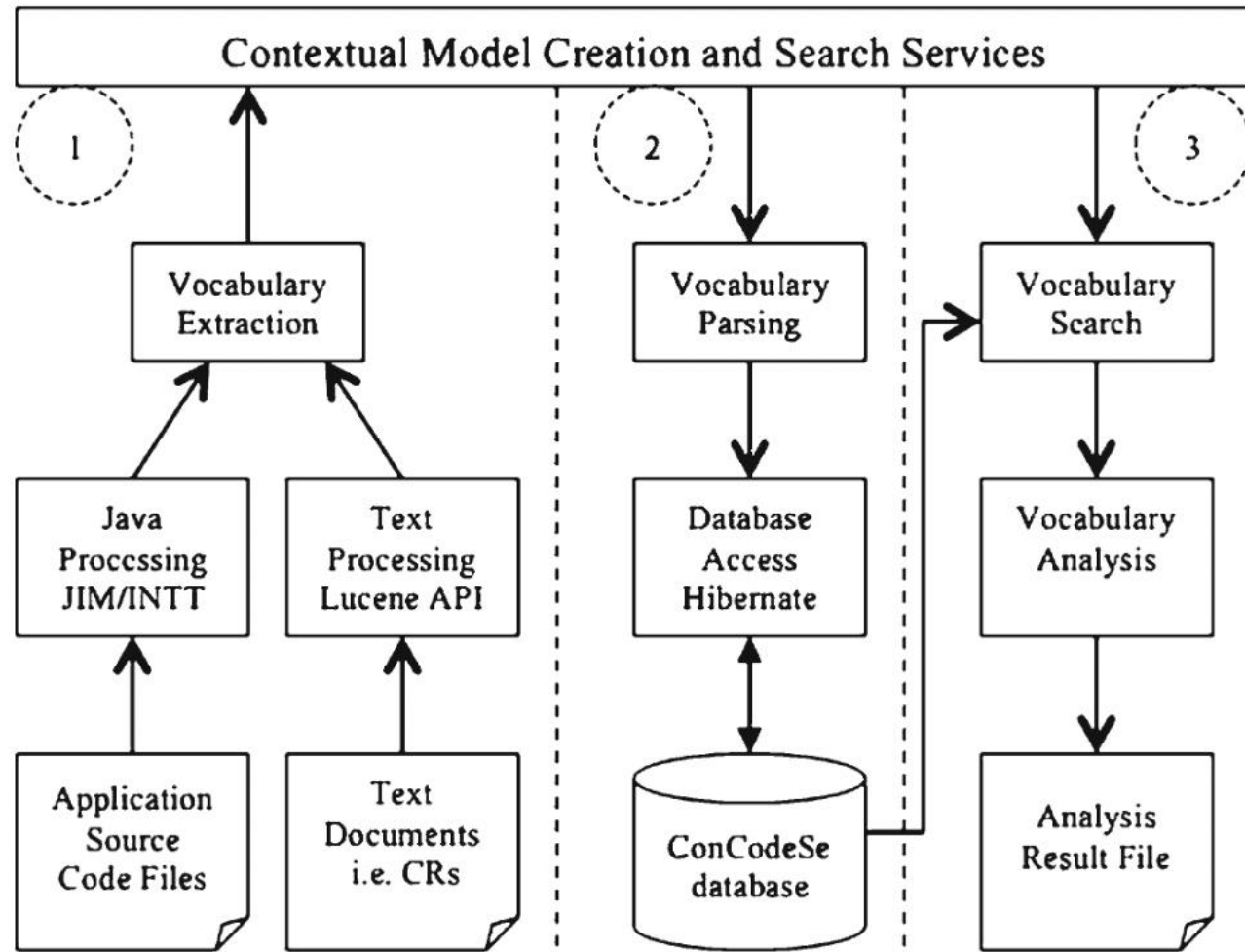
Fig. 1 ConCodeSe data extraction, storage and search

《Information Retrieval and Spectrum Based Bug Localization: Better Together》 2015 FSE/ESEC
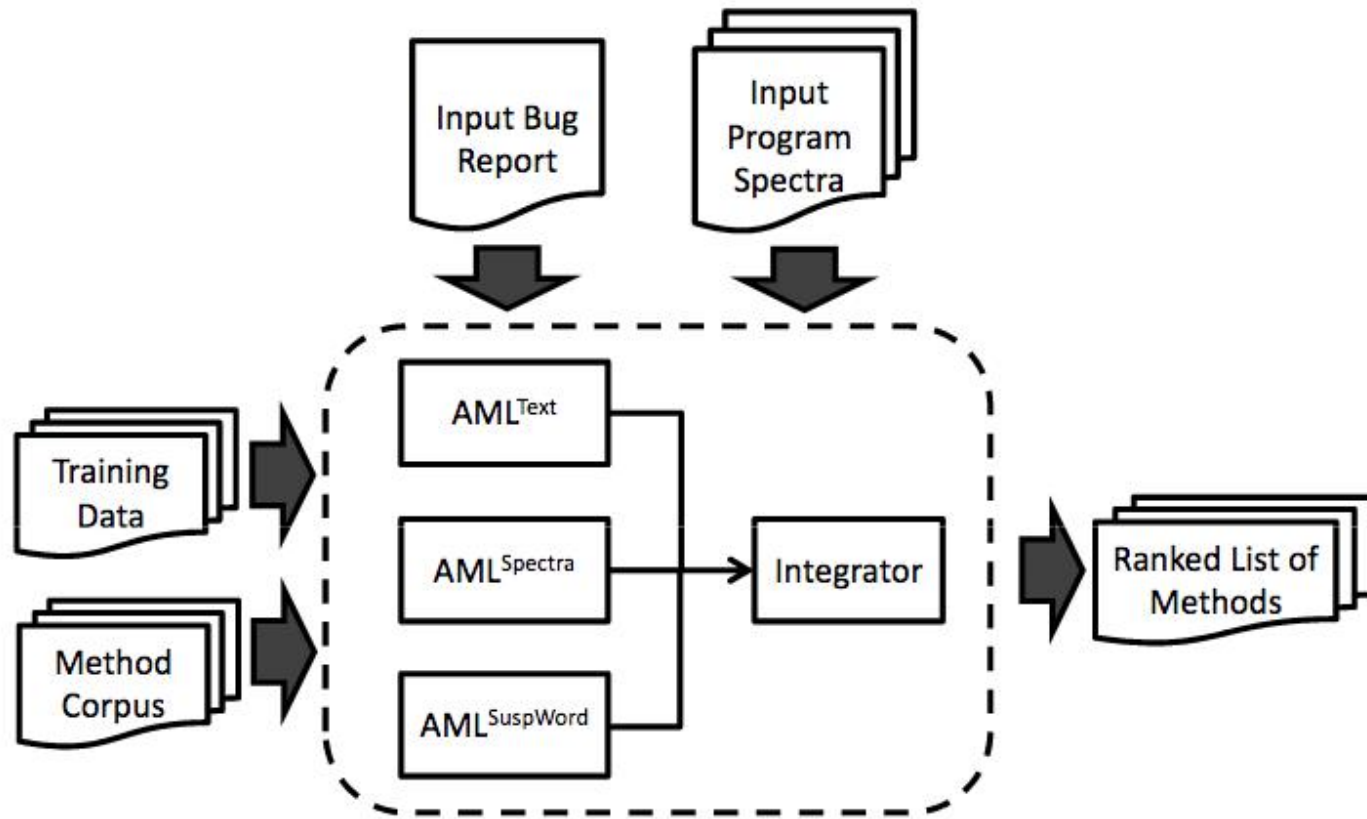

Figure 2: Proposed Approach: AML

《Learning to rank relevant files for bug reports using domain knowledge》 2014 FSE/ESEC

Surface Lexical Similarity

API-Enriched Lexical Similarity

Collaborative Filtering Score

Bug-Fixing Frequency

Bug-Fixing Recency

Feature Scaling

《A Combinatorial Testing-Based Approach to Fault Localization》 2018 TSE

Phase 1:

combination

identification

Phase 2:

faulty statement

localization