

# Zero-Shot Learning for Requirements Classification: An Exploratory Study (Appendices)

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Table 1: Label configurations for the remaining NFR classes for Task NFR, binary classification case (continued to table for Table 6 in the paper).

Label Abbr.	Label Configuration	NFR Label	"Other" Label
<b>Performance</b>			
<i>PE_A</i>	Original 1	'performance'	'not about performance'
<i>PE_B</i>	Expert curated	'periodic execution or efficacy performance'	'not about periodic execution or efficacy performance'
<i>PE_C</i>	Word Embedding (selected from top 20 words)	'throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, or accuracy'	'not about throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, or accuracy'
<i>PE_D</i>	Word Embedding (selected from top 20 words) + Original 2	'throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, or accuracy'	'usability, security, operational, look & feel, legal, fault & tolerance, maintainability, scalability, availability, or portability'
<i>PE_E</i>	Word Embedding (selected from top 50 words) + Original 2	'throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, accuracy, achieve, tuning, bottleneck, better, high, optimize, effectiveness, low, enhances, reducing, increased, quality, faster, or degrades'	'usability, security, operational, look & feel, legal, fault & tolerance, maintainability, scalability, availability, or portability'
<b>Operational</b>			
<i>O_A</i>	Original 1	'operational'	'not about operational'
<i>O_B</i>	Expert curated	'working, running, connecting, interfacing, or operative environment'	'not about working, running, connecting, interfacing, or operative environment'
<i>O_C</i>	Word Embedding (selected from top 20 words)	'environmental, organizational, coordination, systemic, or logistics'	'not about environmental, organizational, coordination, systemic, or logistics'
<i>O_D</i>	Word Embedding (selected from top 20 words) + Original 2	'environmental, organizational, coordination, systemic, or logistics'	'usability, security, performance, look & feel, legal, fault & tolerance, maintainability, scalability, availability, or portability'
<i>O_E</i>	Word Embedding (selected from top 50 words) + Original 2	'environmental, organizational, coordination, systemic, logistics, coordination, or automation'	'usability, security, performance, look & feel, legal, fault & tolerance, maintainability, scalability, availability, or portability'
<b>Look &amp; feel</b>			
<i>LF_A</i>	Original 1	'Look feel'	'not about Look feel'
<i>LF_B</i>	Expert curated	'appearance, interface, look feel'	'not about appearance, interface, look feel'
<i>LF_C</i>	Word Embedding (selected from top 20 words)	'graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, or familiar'	'not about graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, or familiar'
<i>LF_D</i>	Word Embedding (selected from top 20 words) + Original 2	'graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, or familiar'	'usability, security, operational, performance, look & feel, legal, maintainability, scalability, availability, or portability'
<i>LF_E</i>	Word Embedding (selected from top 50 words) + Original 2	'graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, familiar, desire, customize, intent, disability, or impression'	'usability, security, operational, performance, fault & tolerance, legal, maintainability, scalability, availability, or portability'
<b>Legal</b>			
<i>L_A</i>	Original 1	'legal'	'not about legal'
<i>L_B</i>	Expert curated	'legal, law, or rules'	'not about legal, law, or rules'
<i>L_C</i>	Word Embedding (selected from top 20 words)	'liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive, civil, right, patentability, claim, violate, infringement, or counsel'	'not about liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive, civil, right, patentability, claim, violate, infringement, or counsel'
<i>L_D</i>	Word Embedding (selected from top 20 words) + Original 2	'liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive, civil, right, patentability, claim, violate, infringement, or counsel'	'usability, security, operational, performance, look & feel, fault & tolerance, maintainability, scalability, availability, or portability'
<i>L_E</i>	Word Embedding (selected from top 50 words) + Original 2	'liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive, civil, right, patentability, claim, violate, infringement, counsel, holder, dispute, illegal, judicial, ruling, agreement, ownership, comply, authority, law, accountability, abuse, intellectual, obligation, invention, court, ethical, concern, or policy'	'usability, security, operational, performance, look & feel, fault & tolerance, maintainability, scalability, availability, or portability'

Table 1: Continued

Label Abbr.	Label Configuration	NFR Label	"Other" Label
<b>Fault tolerance</b>			
<i>FT_A</i>	Original 1	'fault tolerance'	'not about fault tolerance'
<i>FT_B</i>	Expert curated	'system recovery fault tolerance'	'not about system recovery fault tolerance'
<i>FT_C</i>	Word Embedding (selected from top 20 words)	'tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, or dependable'	'not about tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, dependable, countermeasure, resilience, defensive, corruption, weakness, malfunction, robustness, or stability'
<i>FT_D</i>	Word Embedding (selected from top 20 words) + Original 2	'tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, or dependable'	'usability, security, operational, performance, look & feel, legal, maintainability, scalability, availability, or portability'
<i>FT_E</i>	Word Embedding (selected from top 50 words) + Original 2	'tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, dependable, countermeasure, resilience, defensive, corruption, weakness, malfunction, robustness, or stability'	'usability, security, operational, performance, look & feel, legal, maintainability, scalability, availability, or portability'
<b>Maintainability</b>			
<i>MN_A</i>	Original 1	'maintainability'	'not about maintainability'
<i>MN_B</i>	Expert curated	'maintaining, fixing, running or updating'	'not about maintaining, fixing, running or updating'
<i>MN_C</i>	Word Embedding (selected from top 20 words)	'adaptability, effectiveness, agility, preventive, or dependability'	'not about adaptability, effectiveness, agility, preventive, or dependability'
<i>MN_D</i>	Word Embedding (selected from top 20 words) + Original 2	'adaptability, effectiveness, agility, preventive, or dependability'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, scalability, availability, or portability'
<i>MN_E</i>	Word Embedding (selected from top 50 words) + Original 2	'adaptability, effectiveness, agility, preventive, dependability, correcting, reuse, defect, mitigation, validated, resilience, achievable, remedy, assessing, or maintaining'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, scalability, availability, or portability'
<b>Scalability</b>			
<i>SC_A</i>	Original 1	'scalability'	'not about scalability'
<i>SC_B</i>	Expert curated	'scalable, increasable or developable'	'not about scalable, increasable or developable'
<i>SC_C</i>	Word Embedding (selected from top 20 words)	'flexibility, workload, efficiency, or optimize'	'not about flexibility, workload, efficiency, or optimize'
<i>SC_D</i>	Word Embedding (selected from top 20 words) + Original 2	'flexibility, workload, efficiency, or optimize'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, maintainability, availability, or portability'
<i>SC_E</i>	Word Embedding (selected from top 50 words) + Original 2	'flexibility, workload, efficiency, optimize, caching, improvement, robust, overhead, adaptability, scalable, or increased'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, maintainability, availability, or portability'
<b>Availability</b>			
<i>A_A</i>	Original 1	'availability'	'not about availability'
<i>A_B</i>	Expert curated	'available or timely achievable'	'not about available or timely achievable'
<i>A_C</i>	Word Embedding (selected from top 20 words)	'reliability, dependability, resilience'	'not about reliability, dependability, resilience'
<i>A_D</i>	Word Embedding (selected from top 20 words) + Original 2	'reliability, dependability, resilience'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, maintainability, scalability, or portability'
<i>A_E</i>	Word Embedding (selected from top 50 words) + Original 2	'reliability, dependability, resilience, flexibility, accountability, ensur, disruption, timely, or standby'	'usability, security, operational, performance, look & feel, legal, fault & tolerance, maintainability, scalability, or portability'

Table 2: Label configurations for all the NFR classes for the multi-class and multi-label classification sub-tasks in Task NFR (cf. Table 7 in the paper)

Label Abbr.	Label Configuration	List of Labels
<i>MultiNFR_A</i>	Original	['usability', 'security', 'performance', 'operational', 'look & feel', 'legal', 'fault tolerance', 'maintainability', 'scalability' availability'] ['instructive, easy, helpful, useful, learnable, explainable, affordable, intuitive, or understandable', 'security, authorization, or protection', 'periodic execution or efficacy performance', 'working, running, connecting, interfacing, or operative environment', 'appearance, interface, look & feel', 'legal, law, or rules', 'system recovery & fault tolerance', 'maintaining, fixing, running or updating', 'scalable, increasable or developable', 'available or timely achievable'] [accessibility, aesthetic, contextual, experience, satisfaction, HCI, UX, questionnaire, ease, or ergonomics' , 'vulnerability, securing, protecting, protection, cybersecurity, assurance, cyber, countermeasure, threat, privacy, authentication, prevention, or confidentiality', 'throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, or accuracy', 'environmental, organizational, coordination, systemic, or logistics', 'graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, or familiar', 'liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive,civil, right, patentability, claim, violate, infringement, or counsel', 'tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, or dependable', 'adaptability, effectiveness, agility, preventive, or dependability', 'flexibility, workload, efficiency, or optimize', 'reliability, dependability, resilience'] [accessibility, aesthetic, contextual, experience, satisfaction, HCI, UX, questionnaire, ease, ergonomics, designer, evaluate, multimodal, practitioner, prototyping, preference, personalization, suitability, focus, clarity, responsiveness, judgement, feel, or helpful' , 'vulnerability, security, protection, cybersecurity, assurance, countermeasure, threat, privacy, authentication, prevention, confidentiality, trusted, intrusion, compromise, safety, insecure, defensive, breach, proactive, tampering, penetration, policy, phishing, vulnerable, authorization, dependability, or certification', 'throughput, reliability, scalability, responsiveness, efficiency, workload, benchmark, latency, speed, improvement, accuracy, achieve, tuning, bottleneck, better, high, optimize, effectiveness, low, enhances, reducing, increased, quality, faster, or degrades', 'environmental, organizational, coordination, systemic, logistics, coordination, or automation', 'graphical, gui, ui, widget, interaction, habit, prefer, comfortable, friendly, feeling, experience, familiar, desire, customize, intent, disability, or impression', 'liability, litigation, jurisdiction, regulation, copyright, legislation, enforcement, governmental, directive,civil, right, patentability, claim, violate, infringement, counsel, holder, dispute, illegal, judicial, ruling, agreement, ownership, comply, authority, law, accountability, abuse, intellectual, obligation, invention, court, ethical, concern, or policy', 'tolerance, failure, tolerant, byzantine, deadlock, exploiting, reliability, isolation, fault, guarantee, dependable, countermeasure, resilience, defensive, corruption, weakness, malfunction, robustness, or stability', 'adaptability, effectiveness, agility, preventive, dependability, correcting, reuse, defect, mitigation, validated, resilience, achievable, remedy, assessing, or maintaining', 'flexibility, workload, efficiency, optimize, caching, improvement, robust, overhead, adaptability, scalable, or increased', 'reliability, dependability, resilience, flexibility, accountability, ensur, disruption, timely, or standby']
<i>MultiNFR_B</i>	Expert curated	
<i>MultiNFR_C</i>	Word Embedding (selected from top 20 words)	
<i>MultiNFR_D</i>	Word Embedding (selected from top 50 words)	