

Wyznaczanie tabeli licznosci krok po kroku

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Opis zbioru danych

Za przykład posłuży zbiór danych *contact lenses*¹. Zawiera on cztery atrybuty (tyle samo powstanie tabelki licznosci):

- **age:** *young, pre-presbyopic, presbyopic*,
- **spectacle-prescrip:** *myope, hypermetrope*,
- **astigmatism:** *no, yes*,
- **tear-prod-rate:** *reduced, normal*,

oraz klasę decyzyjną **contact-lenses** przyjmującą wartości: *soft, hard, none*. Liczba próbek wynosi 24.

Tabela: Licznosc poszczegolnych klas.

<i>soft</i>	5
<i>hard</i>	4
<i>none</i>	15

¹ <https://storm.cis.fordham.edu/~gweiss/data-mining/weka-data/contact-lenses.arff>

Tabela dla atrybutu age

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{young} \wedge \text{contact-lenses}=\text{soft})=2$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2		
<i>pre-presbyopic</i>			
<i>presbyopic</i>			

Tabela dla atrybutu age

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{young} \wedge \text{contact-lenses}=\text{hard})=2$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	
<i>pre-presbyopic</i>			
<i>presbyopic</i>			

Tabela dla atrybutu **age**

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{young} \wedge \text{contact-lenses}=\text{none})=4$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>			
<i>presbyopic</i>			

Tabela dla atrybutu age

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{pre-presbyopic} \wedge \text{contact-lenses}=\text{soft})=2$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2		
<i>presbyopic</i>			

Tabela dla atrybutu age

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{pre-presbyopic} \wedge \text{contact-lenses}=\text{hard})=1$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2	1	
<i>presbyopic</i>			

Tabela dla atrybutu age

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{pre-presbyopic} \wedge \text{contact-lenses}=\text{none})=5$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2	1	5
<i>presbyopic</i>			

Tabela dla atrybutu **age**

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{presbyopic} \wedge \text{contact-lenses}=\text{soft})=1$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2	1	5
<i>presbyopic</i>	1		

Tabela dla atrybutu **age**

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{presbyopic} \wedge \text{contact-lenses}=\text{hard})=1$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2	1	5
<i>presbyopic</i>	1	1	

Tabela dla atrybutu **age**

1	young	none	9	pre-presbyopic	none	17	presbyopic	none
2	young	soft	10	pre-presbyopic	soft	18	presbyopic	none
3	young	none	11	pre-presbyopic	none	19	presbyopic	none
4	young	hard	12	pre-presbyopic	hard	20	presbyopic	hard
5	young	none	13	pre-presbyopic	none	21	presbyopic	none
6	young	soft	14	pre-presbyopic	soft	22	presbyopic	soft
7	young	none	15	pre-presbyopic	none	23	presbyopic	none
8	young	hard	16	pre-presbyopic	none	24	presbyopic	none

$\#(\text{age}=\text{presbyopic} \wedge \text{contact-lenses}=\text{none})=6$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>young</i>	2	2	4
<i>pre-presbyopic</i>	2	1	5
<i>presbyopic</i>	1	1	6

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip}=\text{myope} \wedge \text{contact-lenses}=\text{soft})=2$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2		
<i>hypermetrope</i>			

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip}=\text{myope} \wedge \text{contact-lenses}=\text{hard})=3$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2	3	
<i>hypermetrope</i>			

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip}=\text{myope} \wedge \text{contact-lenses}=\text{none})=7$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2	3	7
<i>hypermetrope</i>			

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip} = \text{hypermetrope} \wedge \text{contact-lenses} = \text{soft}) = 3$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2	3	7
<i>hypermetrope</i>	3		

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip}=\text{hypermetrope} \wedge \text{contact-lenses}=\text{hard})=1$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2	3	7
<i>hypermetrope</i>	3	1	

Tabela dla atrybutu **spectacle-prescrip**

1	myope	none	9	myope	none	17	myope	none
2	myope	soft	10	myope	soft	18	myope	none
3	myope	none	11	myope	none	19	myope	none
4	myope	hard	12	myope	hard	20	myope	hard
5	hypermetrope	none	13	hypermetrope	none	21	hypermetrope	none
6	hypermetrope	soft	14	hypermetrope	soft	22	hypermetrope	soft
7	hypermetrope	none	15	hypermetrope	none	23	hypermetrope	none
8	hypermetrope	hard	16	hypermetrope	none	24	hypermetrope	none

$\#(\text{spectacle-prescrip}=\text{hypermetrope} \wedge \text{contact-lenses}=\text{none})=8$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>myope</i>	2	3	7
<i>hypermetrope</i>	3	1	8

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{no} \wedge \text{contact-lenses}=\text{soft})=5$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5		
<i>yes</i>			

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{no} \wedge \text{contact-lenses}=\text{hard})=0$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5	0	
<i>yes</i>			

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{no} \wedge \text{contact-lenses}=\text{none})=7$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5	0	7
<i>yes</i>			

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{yes} \wedge \text{contact-lenses}=\text{soft})=0$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5	0	7
<i>yes</i>	0		

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{yes} \wedge \text{contact-lenses}=\text{hard})=4$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5	0	7
<i>yes</i>	0	4	

Tabela dla atrybutu **astigmatism**

1	no	none	9	no	none	17	no	none
2	no	soft	10	no	soft	18	no	none
3	yes	none	11	yes	none	19	yes	none
4	yes	hard	12	yes	hard	20	yes	hard
5	no	none	13	no	none	21	no	none
6	no	soft	14	no	soft	22	no	soft
7	yes	none	15	yes	none	23	yes	none
8	yes	hard	16	yes	none	24	yes	none

$\#(\text{astigmatism}=\text{yes} \wedge \text{contact-lenses}=\text{none})=8$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>no</i>	5	0	7
<i>yes</i>	0	4	8

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{reduced} \wedge \text{contact-lenses}=\text{soft})=0$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0		
<i>normal</i>			

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{reduced} \wedge \text{contact-lenses}=\text{hard})=0$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0	0	
<i>normal</i>			

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{reduced} \wedge \text{contact-lenses}=\text{none})=12$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0	0	12
<i>normal</i>			

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{normal} \wedge \text{contact-lenses}=\text{soft})=5$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0	0	12
<i>normal</i>	5		

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{normal} \wedge \text{contact-lenses}=\text{hard})=4$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0	0	12
<i>normal</i>	5	4	

Tabela dla atrybutu **tear-prod-rate**

1	reduced	none	9	reduced	none	17	reduced	none
2	normal	soft	10	normal	soft	18	normal	none
3	reduced	none	11	reduced	none	19	reduced	none
4	normal	hard	12	normal	hard	20	normal	hard
5	reduced	none	13	reduced	none	21	reduced	none
6	normal	soft	14	normal	soft	22	normal	soft
7	reduced	none	15	reduced	none	23	reduced	none
8	normal	hard	16	normal	none	24	normal	none

$\#(\text{tear-prod-rate}=\text{normal} \wedge \text{contact-lenses}=\text{none})=3$

	<i>soft</i>	<i>hard</i>	<i>none</i>
<i>reduced</i>	0	0	12
<i>normal</i>	5	4	3